

CIVIL DEFENSE

Part I—Atomic Shelter Tests

Part II—Reorganization Plan No. 1 of 1958

(Providing new arrangements for the conduct of Federal defense mobilization and civil defense functions)

U. S. Congress. House.

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE

↓ COMMITTEE ON

GOVERNMENT OPERATIONS.

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CIVIL DEFENSE

Part I—Atomic Shelter Tests

WEDNESDAY, APRIL 30, 1958

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS,
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met in room 1501-B, House Office Building, pursuant to adjournment, at 10:05 a. m., Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield, Riehlman, Lipscomb, and Minshall.

Also present: Herbert Roback, staff administrator; Carey Brewer, senior defense specialist; Paul Ridgely, and Robert McElroy, investigators.

Mr. HOLIFIELD The hearing will be in order.

For the past several years this subcommittee has been engaged in studies and investigations concerning the civil defense needs of the United States. In July 1956 this subcommittee issued a report entitled "Civil Defense for National Survival."

In July 1957 we issued a report entitled "Status of Civil Defense Legislation."

Our 1956 report was based on exhaustive testimony received from distinguished scientists, doctors, engineers, and other professional persons; responsible public officials in Federal, State, and local government; the Chairman and members of the Joint Chiefs of Staff and other military spokesmen; and informed private citizens, civic leaders, industrialists, and representatives of national organizations.

Our 1957 report was based on hearings held in connection with civil defense legislation introduced by members of this subcommittee and other Members of Congress.

An important feature of the legislation introduced last year is a provision calling for a nationwide system of civil defense shelters for protection against the multiple effects of nuclear weapons.

The hearings beginning today will examine the technical data developed in the atomic shelter tests conducted in Nevada during the past year. Today, tomorrow, and Friday, testimony will be received from scientific and technical experts associated with the Atomic Energy Commission and the Federal Civil Defense Administration in the shelter-testing program. Subjects to be discussed include the radiological, biological, and physical blast aspects of the shelter tests, as well as the costs of the different shelter designs tested.

Some of the members of the subcommittee have a firsthand knowledge of the matters to be discussed, having observed the explosion effects on the shelters tested during the past year.

Besides bringing together the latest authoritative technical information concerning atomic shelter designs and structures, we plan in these hearings to review the basic policy considerations in a nationwide sheltering system.

On Monday, May 5, Dr. Ellis Johnson, director of the Operations Research Office of Johns Hopkins University, will present his views on the role of atomic shelters in the national defense program. The operations research office, under Dr. Johnson's direction, recently concluded a comprehensive study for the Army on defense against nuclear attack.

After our hearings were scheduled, the President submitted Reorganization Plan No. 1 of 1958, which would create a new Office of Defense and Civilian Mobilization, merging the functions of the Federal Civil Defense Administration and the Office of Defense Mobilization. This reorganization plan bears directly on a phase of the legislation before the subcommittee.

Two years ago, in our basic civil-defense report, we criticized the overlapping functions and diffused authority of these agencies and proposed that their civil-defense functions be merged. This provision is contained in section 302 of H. R. 2125, which is before the subcommittee.

In considering that legislation, of course, the subcommittee will have to take account of the President's plan and to determine how it relates to our legislation. Accordingly, we will ask representatives of the Bureau of the Budget, which drew up the plan, as well as the Federal Civil Defense Administrator and the Defense Mobilization Director, who are the parties affected by the plan, to explain it and justify it before the subcommittee.

Representatives of the Budget Bureau will appear before the subcommittee on Tuesday, May 6. ODM Director Gordon Gray and FCDA Administrator Leo Hoegh will appear on Wednesday, May 7. These officials will also be asked to testify on administration policy with respect to broader civil-defense matters, including a possible shelter construction program.

On Thursday, May 8, the subcommittee will receive testimony from representatives of the Department of Defense and the three military departments concerning shelter studies and other personnel protection programs sponsored or undertaken by those agencies.

This morning we are pleased to receive testimony from representatives of the Atomic Energy Commission. Mr. Robert Corsbie, Director of the Civil Effects Test Group, will discuss the joint AEC-FCDA test program in general terms, after which he will introduce the other witnesses associated with the Atomic Energy Commission.

Mr. Corsbie, you may proceed.

STATEMENT OF ROBERT CORSBIE, DIRECTOR, CIVIL EFFECTS TEST GROUP, ATOMIC ENERGY COMMISSION

MR. CORSBIE. Mr. Chairman, I have a statement which has been handed to you.

From its inception every phase of atomic energy development—from mining of ore to weapons tests or operation of reactors and

chemical processing—has placed on the Atomic Energy Commission responsibilities for establishing appropriate safeguards for the protection of operating personnel and the general public.

The scientific and engineering achievements which made possible the control of nuclear energy raised many biomedical questions. In the health sciences, as in fields of physics and engineering, the acceleration in the utilization of nuclear energy brought with it a variety of problems answerable only by additional research.

As nuclear energy applications including advances in weaponry have increased, the research program has expanded in terms of total effort and fields of investigation. Its rate of growth has been limited largely by the availability of qualified research personnel. Despite extensive specialized training sponsored by AEC and other governmental and private agencies, there exist acute shortages of scientific and technical personnel capable of conducting biomedical and allied research.

Approximately 35 percent of this program is performed under contract with institutions of higher learning, hospitals, research institutes, and foundations, it being impractical to centralize all such research in the AEC laboratories.

The fiscal year 1958 program, estimated at \$38 million, comprises a broad investigation with emphasis on radiation effects. Much work is directed toward long-term and basic studies because of the peculiar nature of the biological response to ionizing radiation. In broad aspect, the AEC biomedical and nuclear effects research includes:

A. BASIC PROGRAM

I. Irradiation effects—Analysis of the effects of radiation on biological systems: To determine the effects of all kinds of ionizing and nonionizing radiation on all kinds of living things—plant and animal, including man and his total environment.

II. Combating injury—Development of methods for counteracting the detrimental effects of radiation: To devise means and procedures for preventing, minimizing, alleviating and compensating for irradiation injury; to find methods that can be used by man to defend himself, his crops, and his livestock against the damaging effects of radiation.

III. Beneficial application—Utilization of Atomic Energy and radioactive materials for solution of biological and medical problems: Through scientific investigation and application of practical procedures to devise ways of utilizing radiation for beneficial purposes—sterilization, food preservation, creation of new biological products, radiodiagnosis and therapy, and basic scientific studies of biological processes—especially in medicine and agriculture.

IV. Biomedical problems—Analysis and handling of impediments to health arising from development, production, testing, and utilization of particle accelerators, radioactive sources, atomic fuels, reactors, and weapons: To deal with radiation as an occupational hazard, taking into account the transport of radioactive materials, particularly air and waterborne fission products, the problem of burns and concussions, population-group responses, adaption to life in radiation fields, radioactive waste disposal, engineering aspects, toxicity

of radioactive and nonradioactive materials required for atomic industry, permissible exposure levels and dissemination of information.

V. Dosimetry and instrumentation—Development of approaches, procedures, and equipment for radiation detection and measurement: Through improvement of dosimetry to provide the foundations required for radiobiological and radiomedical work—development of instruments and equipment for dosimetry, particularly for protection of personnel, for automation, for computer work, analysis, and communications.

B. CIVIL EFFECTS PROGRAM

The lack of basic data concerning the phenomena associated with nuclear detonations and lack of data on appropriate scaling factors necessary for extrapolating from laboratory to field conditions, led to the conduct of full-scale field experiments. These were designed to provide urgently needed data on effects of nuclear weapons.

Following AEC-FCDA participation in Operation Buster-Jangle, 1951, as part of the military effects test group, Dr. Alvin C. Graves, test director, Operation Upshot-Knothole, 1953, recommended the establishment of the Civil Effects Test Group, CETG, as a part of the Nevada test organization and assigned the group directors the task of planning, supervising, coordinating, and conducting the civil effects program. The Division of Biology and Medicine, USAEC, was requested to designate a director of CETG for Operation U-K. I was selected and have served in that capacity during each subsequent Nevada test series.

The Division of Biology and Medicine is responsible to the Atomic Energy Commission for planning, screening, and coordinating projects in the civil effects program. Proposed experiments are:

1. Screened to assure (a) nonduplication of effort, (b) necessity for doing the experiment in a field test, and (c) feasibility of implementation.
2. Coordinated with the Department of Defense and other interested agencies, such as FCDA.
3. Scheduled for an appropriate series and shots.

In addition, this group is also responsible for maintaining the necessary mechanism to assure that experimental results are properly reported in the technical literature. They also provide for a continuity for civil effects programs and thus permits long-range planning which can be most effectively coupled with other continuing laboratory research.

The trends in weapons development, and new and improved instrumentation and radiation dosimetry have made full-scale field biomedical studies a valuable and an indispensable means for updating and reevaluating a large volume of previous data.

Therefore, the civil effects programs take into account (a) work begun on previous operations; (b) advances in weaponry; (c) the increased uses of nuclear energy; and (d) long-range AEC program objectives.

The technical reports resulting from Operation Plumbbob and previous operations are designed to supply information necessary for the improvement of national self-defense and establishment of safeguards for peaceful applications of nuclear energy.

To this end, every effort is made to assure that results of these tests are promptly made available to the public in unclassified reports insofar as consistent with national security. This permits immediate practical application of knowledge gained as well as guidance in continuing research in individual, community and national self-protection against all parameters of nuclear effects.

C. SPECIAL PROJECTS AND EXERCISES

The AEC uses the Nevada test site to conduct special programs and exercises. Some of these are designed to provide information of special interest to FCDA. Three exercises have been conducted to date and a fourth is planned for spring 1958.

These studies are as follows:

I. Operation Arme, 1955—Aerial radiological monitoring exercise: The operation consisted of an aerial radiological monitoring exercise conducted at NTS by AEC in October 1955 for personnel designated by FCDA. The objective was to acquaint participants representing all echelons of civil defense with aerial survey techniques and equipment developed by the AEC for monitoring large water and land areas rapidly with small doses for operating personnel.

Instrumentation consisted of an airborne radiation detection equipment and a telemetering unit to transmit data to a remote ground station. The exercise successfully demonstrated the feasibility of equipment of this type for rapidly monitoring areas contaminated with fallout radiation.

II. Operation—Pre-Plumbbob, 1956, aerial radiological survey of the Nevada test site and adjoining areas: In October 1956, the Atomic Energy Commission sponsored an aerial survey of the NTS and adjoining areas to gather radiological information prerequisite to Operation Plumbbob. At the invitation of the AEC, the Federal Civil Defense Administration joined in support of the project.

The survey was conducted by the USGS using DC-3 aircraft and aerial radiation detection equipment designed and constructed by the Oak Ridge National Laboratory. The project successfully surveyed about 3,400 square miles of southeastern Nevada and adjoining part of California, about half of Utah and parts of adjoining Arizona, New Mexico, and Colorado.

This survey further demonstrated the value and feasibility of utilizing aerial techniques for rapidly locating and measuring ground radiological contamination over widespread areas.

III. Civil effects exercise 57-1, 1957—Radiological assessment and recovery of contaminated areas: This exercise was conducted in December 1957 for the purpose of determining the feasibility of obtaining information on radiological countermeasures through the employment of a variety of decontamination techniques on residual radioactive material remaining at certain onsite structures and ground areas at NTS and to determine the usefulness of using low-level contaminated areas for orientation and training. This exercise was successfully completed and the report is in preparation.

IV. Civil effects exercise 58-1, 1958—Radiological survey and evaluation of protection afforded by home shelters against fallout: This exercise is planned for spring 1958. The purpose of CEE-58-1 is to utilize existing residential structures at the NTS to make comparative

measurements of shielding against fallout radiation; to investigate means for improving the shielding in typical residences quickly and easily; to investigate the possibilities for gaining a limited improvement in the permanent shielding factor of a house inexpensively; to develop a test vehicle or prototype mobile unit equipped to simulate fallout radiation intensities and geometry and to make measurements of the shielding characteristics of a structure; and to investigate methods for measuring to a reliable degree the shielding characteristics of multistoried buildings.

In addition, the experimental data gained through this work will be coordinated with work being done by NBS and Project Civil UC under contracts to FCDA.

CIVIL EFFECTS TEST GROUP OPERATION PLUMBBOB

My remarks are intended to give a bird's-eye view of some of the civil effects tests being performed as one of the scientific and technical groups under the direction of Dr. Gerald Johnson, scientific test director, Operation Plumbbob.

This group of tests comprised 10 programs, 54 projects, and about 250 shot participations. The field organization over the several months operation period used for varying periods of time a peak population of about 400 medical doctors, physicists, veterinarians, biologists, chemists, architects, engineers, and other specialists including staff personnel.

It is recognized that the need for information useful to individual, community, and national self-protection parallels the development of nuclear weapons and the utilization of nuclear energy. The scientific and technical content and the objectives of the Civil Effects Test Group is determined by this urgent need for up-to-date information on the effects given by a family of nuclear weapons and any possible effects from the peacetime applications of atomic energy.

It is recognized that we are already well in to the atomic age. Learning to live with the byproducts of nuclear reactions is necessary and urgent. We need to know on a continuing basis about the ways in which blast, heat, radiation, light, and radioactive fallout affect people, food, drink, houses, suburban communities, and rural villages, services, utilities, and transportation.

Probably the most significant aspect of the civil effects test program, Operation Plumbbob, was the coordination of continuing laboratory research and less frequent test activities in planning projects to provide information essential to an adequate understanding of nuclear effects on life in all its phases.

Our weapons development tests afford an opportunity to augment laboratory experiments with new and useful knowledge from nuclear detonations. Continental tests afford unusually good opportunities to verify in the field various theoretical concepts and laboratory programs which are directed toward complete knowledge of effects on man.

This coupling of the laboratory and full scale test activities provide a continuous flow of basic data usable in immediate practical applications and in planning future research into the means of national self-protection, individual survival, and accommodation of medical practice to the atomic era.

At the briefing of this committee in April 1957 in Washington, at the Nevada test site in August 1957, and a special briefing and tour of NTS by the chairman in December 1957, you were informed of the program. At that time the content of the CETG Plumbbob Program was separated into the following categories:

(1) Fallout radiation; (2) prompt-gamma and prompt-neutron radiation; (3) blast effects on structures; (4) blast biology studies; (5) radiological countermeasures and training; and (6) instrumentation and supporting services.

It is our understanding that the present hearings are concerned principally with the state of knowledge on shelter and related matter. As background to testimony which will be provided by CETG program and project directors and others on details of shelters and tests, I desire to give a short summary of background work in Nevada and in the laboratory which lead to the Plumbbob investigations.

In 1951, the Atomic Energy Commission and the Federal Civil Defense Administration tested a number of shelters. At that time the nominal or 20-kiloton weapon associated with World War II was accepted as the energy release of principal interest. To obtain basic information on components usable in shelters we tested a prototype underground shelter built of 7-foot 6-inch inside diameter concrete pipe, and corrugated metal pipe of the same size to compare the cost and response of the 2 materials.

In selecting the materials, we were influenced by the advantages of utilizing materials commercially available from coast to coast, from the gulf to Canada, and which could be erected rapidly with conventional tools and nonspecialized labor.

The shelter has been exposed to a number of detonations, several of which gave overpressures higher than those from the Hiroshima and Nagasaki detonations at ground zero. The shelter survived physically but the results directed our attention principally toward the question of acceptable shelter environment.

At the same time the Federal Civil Defense Administration tested a variety of some 28 home shelters under a series of detonations without repair to structures between shots. The information obtained was useful in the preparation of guides and pamphlets for the use of homeowners to provide a shelter within or near their homes. Although measurements of blast radiation and thermal effects were somewhat primitive in comparison to the more advanced instrumentation that we have today, useful information was gained.

The Buster-Jangle results of the 1951 series were used to improve the design and construction of shelters to provide protection against radiation and thermal effects and to resist physically the overloading of the blast.

In 1953 additional shelters were tested, using the structural cross sections or components which had successfully resisted the blast loadings of the 1951 exposures. These shelters were underground with at least 3 feet of cover and were constructed of a reinforced concrete entrance with precast concrete and corrugated metal pipe shelter body.

They provided basic data for later designs. For these tests, animals were used to investigate the biological effects of blast and also the biological effects of ionizing radiation.

Much of our data on biological material came from this experiment in investigating the effects of overpressures and underpressures.

As in 1951, the Federal Civil Defense Administration tested improved models of family shelters including the basement lean-to types designed principally to protect against collapsing overhead structures. Also reinforced concrete and masonry structures designed to be built outside of houses with or without mounded earth cover and some buried sufficiently deep for the cover to remain at grade were included.

Considerable information was gained on the physical resistance of materials and combinations of materials to static and dynamic pressure phenomena, but more was gained concerning the importance of the shelter environment and its relation to biological acceptability.

Following the Upshot-Knothole series of 1953, the problem was returned to the laboratory and through the utilization of high explosives, low charges and high charges, shock tubes and wind tunnels new designs were produced for testing under still higher pressures and more severe combinations of effects.

These investigations provided the criteria for the design of shelters included in the civil effects test program in Operation Teapot in 1955. We tested a variety of shelters and structures principally sponsored by the Federal Civil Defense Administration.

The AEC directed its principal attention toward investigating the biological environment of the interiors. FCDA shelters were designed and successfully tested under overpressures of the order of 100 pounds per square inch. Some of the shelters had open doors, some closed.

In addition to heavy reinforced-concrete shelters tested under high overpressures, a variety of family-type shelters was tested at lower pressures out to about 2 pounds per square inch. Some of these were in basements; some were garden types intended for dual use and designed to give more protection than would be available to a person in the average house, especially those without basement.

Others were designed to give a high degree of protection under overpressures of the order of 20-30 pounds per square inch. In some of the shelters, animals were recovered from collapsed houses—friendly and wagging their tails. This evidence of survival, backed up by pressure, thermal, and radiation measurements, gave additional information for use in drawing a finer bead on structural aspects and biological acceptability of shelter environments.

This brings us to the shelters, structures, and components in Operation Plumbbob. For the continuing investigations of biological effects of overpressures associated with blast biology, we used principally shelters which were constructed and tested in 1955. To satisfy the ever-increasing urgency for information concerning the behavior and response of engineering designs and materials under blast loadings, new types of design have come from the drafting rooms, including recognition of the importance of the dual use of structures for protection against blast and other nuclear effects. Others will cover in detail the scope, magnitude, and results of the Plumbbob shelter tests, including physical damage, biomedical aspects, blast biology, and radiological tests.

In conclusion of these introductory remarks, let me add that every effort is being made to place the information obtained from this group of scientific and technical tests in the hands of civil defense, industry, and the public at the earliest possible time.

In summary, Mr. Chairman, from earlier briefings in April 1957 on the Plumbbob program, visits of your staff to the Nevada test site in September, and visits by your staff and yourself in December, you are quite familiar with many of the details.

If I overlook or do not cover in sufficient detail any part of this, on the assumption of your knowledge, I will be glad to fill it in as you may require.

It is proposed to present our testimony under four general headings. Following my general remarks on the AEC's efforts over the last 5 or 6 years in the area of investigating shelters and components of shelters and nuclear effects as related to shelters, we will cover then, through Dr. Paul Tompkins, of the Naval Radiological Defense Laboratory, the matter of radiological shelters; Mr. Luke Vortman, of Sandia Corp., then will cover the state of knowledge on blast loadings of structures, including aboveground structures, underground structures, shelters, and related construction. He will be followed by Dr. Payne Harris, speaking on the biomedical effects of radiation, principally prompt radiation, I believe, and tomorrow morning we will have Dr. White, from the Lovelace Foundation, Albuquerque, N. Mex., to speak on biological effects of blasts and related phenomena.

In summary, from its inception, every phase of atomic-energy development, in all of our activities, from weapons tests to operation of reactors and chemical processing, has placed on the Atomic Energy Commission responsibilities for establishing appropriate safeguards for the protection of operating personnel and the general public.

Not only in the health sciences, but also in the fields of physics and engineering, the acceleration and utilization of nuclear energy have brought with it a variety of problems answerable only by additional research. The rate of growth at the research program has been limited largely by the availability of qualified research personnel.

At present, approximately 35 percent of the Atomic Energy Commission research program in the biological and related sciences is performed under contract with institutions of higher learning; that is, hospitals, research institutes, and foundations. We have found it impracticable to centralize all such research in AEC laboratories.

Our fiscal year 1958 program is estimated at \$38 million. It comprises a broad investigation, with emphasis on radiation effects. Much work is directed toward long-term and basic studies because of the peculiar nature of the biological response to ionizing radiation.

In broadest aspect, we identify our activities as follows:

1. A basic program which falls into four categories; irradiation effects—that is, analysis of the effects of radiation on biological systems; 2, combating inquiry, or development of methods for counteracting the detrimental effects of radiation; 3, beneficial applications, the utilization of atomic energy and radioactive materials for solution of biological and medical problems; 4, biomedical problems.

That is the analysis and handling of impediments to health arising from development, production, testing, and the utilization of particle accelerators, radioactive sources, atomic fuels, reactors, and weapons.

The fifth item under this first category, dosimetry and instrumentation, is the development of approaches, procedures, and equipment for radiation detection and measurement.

The second program is called the Civil Effects Test Group. The lack of basic data concerning the phenomena associated with nuclear detonations and lack of data on appropriate scaling factors necessary for extrapolating from laboratory to field conditions led to the conduct of full-scale field experiments to investigate biomedical and related subjects.

In very brief summary, the civil effects test program was established following the Buster-Jangle series in 1951. The Division of Biology and Medicine was requested to designate a director, which was done, and the Division has filled the position in each subsequent series.

The Division of Biology and Medicine is responsible to the Atomic Energy Commission for planning, screening, and coordinating projects in the civil-effects program.

Now in addition, our screening committees or groups are responsible for maintaining the necessary mechanism to assure that experimental results are properly recorded in the technical literature. This applies equally to our test activities, as to the laboratory work. They also provide for continuity for civil-effects program, and thus permit long-range planning, which can be most effectively coupled with other continuing laboratory research.

The third program of activity, in addition to the basic research in the civil-effects program, is what we call civil effects special projects and exercises. Some of these are familiar to you. We call them special projects and exercises, and they use the Nevada test site at times between operations or, in other words, do not require detonation of nuclear devices to carry on the work.

We have conducted 3 to date, 1 in aerial radiological monitoring in 1955. This was to establish the feasibility of rapidly determining the contamination from nuclear detonation without exposing ground monitors. This was performed by the Atomic Energy Commission to demonstrate to the Federal Civil Defense Administration what we had accomplished in aerial monitoring, not primarily for civil-defense purposes, but in connection with Pacific and Nevada test operations.

Second, in 1956, we conducted an aerial radiological survey of the Nevada test site and adjoining areas which used a different type or kind of equipment but was the continuation of feasibility studies on aerial monitoring techniques.

A third activity was conducted in December 1957 in which particular attention was paid to using low-level fallout to develop techniques and procedures that might be useful in evaluating radiation hazard associated with typical residences, and decontamination or cleanup techniques.

Beginning May 2, or the day after tomorrow we have a fourth activity which we call civil effects exercise 58-1. This is a radiological survey in the evaluation of protection afforded to home shel-

ters against fallout. This is a program coordinated with the Federal Civil Defense Administration and its contractors, the National Bureau of Standards and the University of California.

The scientific responsibility or leadership will be with our Oak Ridge operations office. The objectives include the use of artificial sources to simulate a fallout field and make a radiological survey of typical residences in such environment and then attempt to improvise simple expedients or means for improving the shielding provided to occupants in a house or in a shelter location in the house.

In addition to those mentioned, we have two others. One is civil effects project 58-3, which is a continuing study on shielding and dosimetry as related to the data collected by the Atomic Bomb Casualty Commission in our efforts to decrease the error in dose received by survivors of the weapons detonated in 1945 in Japan. The other, civil effects project 58-3—incidentally, these last two came in too late to be included in the statement I made—

Mr. HOLIFIELD. Will you go into detail on the rest of your statement there? It would appear to me to be important enough to be gone into from point four on down, including these inserts.

Mr. CORSBIE. 58-3 is an investigation of thermal effects on the interior of shelters.

Now, coming then to the last part of the statement, Plumbbob, I will cover it very rapidly.

This was the program in 1957. It comprised 10 programs, 54 projects, and about 250 shot-participations. The Federal Civil Defense Administration requested that 4 of the 9 programs be assigned to them.

Mr. HOLIFIELD. Give us the rest of this as it is written, will you please, Mr. Corsbie? Will you follow through on that? I think it is something we may want to look at very carefully and if you skip over it as you have the rest, we will not get it.

Mr. CORSBIE. All right, sir.

The program was under the direction of Dr. Gerald Johnson, Scientific Test Director, Atomic Energy Commission, Operation Plumbbob. This group of tests comprised 10 programs, 54 projects, and about 250 shot participations.

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In conclusion of these introductory remarks, let me add that every effort is being made to place the information obtained from this group of scientific and technical tests in the hands of Civil Defense, industry and the public at the earliest possible time.

Mr. HOLIFIELD. Thank you, Mr. Corsbie.

Now, can you give us a little more accurate account of timing than you do in this last paragraph here?

Just what has been done in the way of giving this information to Civil Defense, industry and the public, and what is planned and how long will it take you to accomplish this?

Mr. CORSBIE. As a policy, the Civil Effects Test Group tries to write unclassified reports. This policy was adopted in 1955 and we found that more than 50 percent of our reports could be written unclassified.

In Operation Plumbbob there were approximately 57 projects. At present we have printed and distributed 17. We have in review 11. We have 29 of them forthcoming.

Of those that have been distributed, there are only 2 classified, 3 are "official use only" and 12 are unclassified.

Of these I would like to say that six of them are for sale through the Office of Technical Services. We have given to you here one of our unclassified reports. It is on the test of the radiological shelter, CETG project 32.3. We would expect the remaining reports will be through the editorial processing within 45 days.

Mr. HOLIFIELD. The Chair would encourage you to make every effort to declassify everything it is possible to declassify. In my opinion the strict policy of classification will not be in the interests of the American people.

Sometimes some of the people who deal with these subjects are prone to become a little bit overcautious and when it comes to weapon effects on structures and things like that which are of great importance to the American people, in my opinion there are ways and means by which most of this material can be made available without revealing the particular peculiarities of the weapon used. Pressure in pounds per square inch and the resistance of these buildings can be given and so forth.

Many of these things can be declassified. I hope in the producing of your reports you will keep that in mind.

Mr. LIPSCOMB. What do you do with your classified material?

Mr. CORSBIE. The classified material is distributed to those on the distribution list, including the Department of Defense, Civil Defense, and other agencies who make a request or who would have access to these reports.

Mr. LIPSCOMB. Do you notify them or do they have to find out about it?

Mr. CORSBIE. Each agency is polled early in an operation for a distribution list. When the reports are printed at Oak Ridge, the Technical Information Services extension, they already have a distribution list, which provides for routine distribution.

Mr. LIPSCOMB. Who has the responsibility for determining which should be classified and which should be unclassified?

Mr. CORSBIE. It is the test classification officer in the case of an operation. There is one person who is designated to pass on matters associated with classification and our reports are passed through this person with the request for as much guidance as he can give us. If it is determined that any part of the report is classified, we attempt through changes of language or otherwise to produce an unclassified report.

Mr. LIPSCOMB. Would FCDA have available to them all classified material, or is there still another classification?

Mr. CORSBIE. They would have all classified test material except as it deals with weapons design and components.

Mr. LIPSCOMB. You said 50 percent of the material was unclassified, which would leave 50 percent classified. Would FCDA have an opportunity to look at all that 50 percent that was classified?

Mr. CORSBIE. All except a very small part that would be in the category of weapons design, and not weapons effects.

Mr. HOLFIELD. It would not be necessary for them to know how a weapon was designed if you gave to them the intensity of the radiation which occurred and the blast and the heat readings. From the standpoint of their function, this would cover the essential information which they would need, would it not?

Mr. CORSBIE. Yes, sir, and in further explanation, to make sure this point is clear. Weapons effects information—although some are classified, such as the effectiveness of the yield of a weapon, the ranges of radiation, and some of the measurements of radiation—is routinely transmitted to the Federal Civil Defense Administration. Also since FCDA participates jointly with us in operations, they are familiar with much of the data and much information is obtained by them in their own programs.

The only information not transmitted are weapons design, components, the amount of material in the weapon and the actual configuration of the weapon.

Mr. HOLFIELD. In your opinion, the release of the diameter of the circle of radiation of specific degree of intensity and relating it to, say a 20-ton weapon, would that be considered classified?

Mr. CORSBIE. No, sir. That is presently in the effects of nuclear weapons. The scaling laws for various yields are given, as to the range of radiation, the range of blast.

Mr. HOLFIELD. This would give to the FCDA the basic information to prepare shelters or other types of protective programs for specific situations and conditions, notwithstanding the fact that you

did not tell them the shape and the components of the weapon detonated?

Mr. CORSBIE. In our opinion, the shape has little to do with it. The effect is important, at a particular location. So if we take a location X feet or X yards from any detonation and say, "At this point you have an overpressure of some stated number, you have a radiation measure in neutrons and gamma radiation of some number," that is information you can use to design protection at that point against those effects.

Mr. HOLIFIELD. In your opening paragraph you say that atomic energy development has placed on the Atomic Energy Commission responsibility for establishing appropriate safeguards for the protection of operating personnel and the general public. That is a general statement.

How far do you feel the Atomic Energy Commission is responsible for the protection of the general public?

Are you referring there to the operations of the Atomic Energy Commission or are you referring further by going into the effects of weapons?

Mr. CORSBIE. My remarks in this statement, Mr. Chairman, were intended to apply primarily to the safeguards and precautions that are set up in connection with our test activities.

Mr. HOLIFIELD. Test activities and the operations of your plants.

Mr. CORSBIE. However, it is recognized there is additional responsibility, but for testimony on that I would prefer to bring in those responsible for other programs.

Mr. HOLIFIELD. As far as you are concerned, you feel that that responsibility in the field of weapon testing is quite broad. In other words, these tests must be conducted whether they are conducted in the continental limits or in the South Pacific, and there is an overriding responsibility on your part to conduct those tests as safely as possible.

Mr. CORSBIE. To conduct them in such a way that they are regarded as safe by the most competent people we can have to look at any possible contingency arising from a detonation.

Mr. HOLIFIELD. And in the setting up of those standards of safety, what degree of protection do you require? If a certain amount of exposure is considered damaging, where do you set the standards to protect the public against that amount of exposure?

Do you allow a latitude of safety there below the amount that you consider to be deleterious?

Mr. CORSBIE. Yes, sir. Let me try to answer, and if it is not satisfactory, I would like for Dr. Harris, a medical doctor of wide experience, to give more detail.

We set the criteria at such level as to assure there is no permanent damage. Whether this has to do with the effect of a flash of a bomb on the human eye or whether it is the radiation that is received from fallout on the population or whether it is radiation received by operational people on site. For our operational people we have a higher permissible dose than that off site, but we think that received by the operational people is not beyond normal biological recovery. The body can repair whatever damage it receives from this level of radiation.

Mr. HOLIFIELD. We do not intend to go deeply into this particular phase of the subject, since it is not the purpose of this particular hearing, but could you give us in terms of milliroentgens, or any division of roentgens, what you consider to be the maximum permissible operational dose and relate that to the exposure which is considered safe for the general public? Do you have those figures available? Do you or Dr. Harris or Dr. Tompkins?

Mr. CORSBIE. I would be glad to provide for the record, sir, the amount of radiation in Operation Plumbob. The maximum dose was three roentgens for offsite population. Three thousand m./r., or 3 roentgens.

For the operational people, there was a maximum dose of 3.9 r. for a 13-week period, or 5 r. within the total operational period—I think limited to a year.

Mr. HOLIFIELD. Would you give us an example of what a 3-roentgen or a 3.9-roentgen or a 5-roentgen exposure would be to a body fluoroscopic examination so that we would have some comparison between your criteria and that which a person receives who has a fluoroscopic chest examination, if it is possible to give us that?

Mr. CORSBIE. May I refer this to Dr. Harris?

STATEMENT OF DR. PAYNE S. HARRIS, LOS ALAMOS SCIENTIFIC LABORATORY, AND DIRECTOR, CETG PROJECT 39.7

Dr. HARRIS. Sir, what is actually obtained during a fluoroscopic examination depends to some extent on the type of examination and the type of X-ray equipment used.

Fluoroscopic equipment, in general use, of low peak kilovoltage, poorly filtered, will give amounts of radiation equivalent to or greater than that allowed for total body radiation under operational conditions in the field.

It is possible, and in the medical profession now it is being done, to improve such equipment so that the levels that are obtained in a complete type of examination in which perhaps 40 to 50 percent of the total body volume is radiated, so that the total dose given is in the neighborhood of 100 milliroentgens or less, which is, of course, well below that allowed for operational work in the Commission, both in its laboratories and in field operations.

Mr. HOLIFIELD. Stepping down to the body X-ray which, of course, gives less exposure, what does it ordinarily run? An ordinary body X-ray?

Dr. HARRIS. This again depends upon the machine. The ordinary chest film, that is used in mass survey work for tuberculosis, these particular types of equipment give to a restricted area of the body surface a number of milliroentgens which is perhaps 10 times that given by those types of equipment which take large plates, that are used for detailed examinations and these levels, exact levels that are given in these cases are a number of hundreds of milliroentgens.

Mr. HOLIFIELD. When you say milliroentgen, you mean thousandths of a roentgen?

Dr. HARRIS. Yes.

Mr. HOLIFIELD. So the amount you allow offsite of 3 roentgens is quite a bit more than a person receives in either a fluoroscopic or an X-ray body examination?

Dr. HARRIS. Sir, I would like to correct one point, I believe.

Dr. Tompkins, Dr. Vortman, and myself agree that the level offsite for operation is not 3 roentgens. It is much less than that. It is essentially a factor of 10 below 3 roentgens.

Mr. HOLIFIELD. Let us reduce that to milliroentgens.

Dr. HARRIS. That would be 300 milliroentgens.

Mr. HOLIFIELD. Well, this makes quite a difference, you see, in the testimony.

Then your offsite allowable of the exposure does correspond with a fluoroscopic examination?

Dr. HARRIS. Of certain types, yes, sir.

Mr. HOLIFIELD. And in a fluoroscopic examination, I realize the time element enters into it. If it was left on the patient an unusual length of time, it would run higher than the offsite.

Dr. HARRIS. It could, yes, sir.

Mr. HOLIFIELD. And if it was just instantaneous, it would be less.

Let us get to some comparison.

Your 13-week allowable is 3.9. Are you in agreement upon that figure?

Dr. HARRIS. Yes, sir.

Mr. HOLIFIELD. And that is accumulated? That is the accumulated exposure?

Dr. HARRIS. Yes, sir.

Mr. HOLIFIELD. And if you had several fluoroscopic or X-ray examinations that would also be cumulative?

Dr. HARRIS. Well, sir, I do not quite understand what you mean by "accumulative."

Mr. HOLIFIELD. I mean the exposure. The radiation.

Dr. HARRIS. The total dose is accumulative, but the response to a dose, the effective response to a dose has some relation to the time over which the dose is given.

Mr. HOLIFIELD. That is true.

Dr. HARRIS. So that the effective level of dose, after a number of X-ray exposures separated in time, in which the total accumulated dose would be equal to or greater than what is allowed for operational purposes, the effective dose in terms of body effect may very well be less than for the single-shot exposure during a field operation.

Mr. HOLIFIELD. That is true, but we are not talking about a single shot; we are talking about a 3.9 roentgen exposure over a 13-week period, which is an accumulative rate, is it not?

Dr. HARRIS. This can be given. The regulations for field operations are such that the 3.9 can be obtained in any time period over this 13 weeks.

Mr. HOLIFIELD. That is true, but if it is contained in the one shot you remove the individual and do not allow him to have any more.

And your 5 roentgens operational dose for 1 year, that is also accumulative and if it is given in 1 dose you remove that individual from further exposure.

Dr. HARRIS. Yes, sir.

Mr. HOLIFIELD. Are there any further questions?

Mr. CORSBIE. Well, Mr. Chairman, since we were dealing with numbers that I was not prepared to talk about I would like permission to provide for your committee copies of the operational criteria which spells out in detail these numbers that we have been discussing.

Mr. HOLIFIELD. All right, if it is provided in laymen's terms so we can understand it, we will accept it.

(The information requested, appears below :)

UNITED STATES ATOMIC ENERGY COMMISSION,
Washington, D. C., May 12, 1958.

HON. CHET HOLIFIELD,

Chairman, Subcommittee on Military Operations, Committee on Government Operations, House of Representatives.

DEAR MR. HOLIFIELD: In reply to your request of April 30, 1958, the radiological safety criteria for the Nevada test site are given below.

For operational personnel onsite, the maximum exposure to whole body external gamma radiation is 3.0 roentgens for any 13 consecutive weeks and a maximum of 5 roentgens within a period of 1 year.

For the general populace offsite, the Atomic Energy Commission adopted, as an operational guide, 3.9 roentgens whole body external gamma radiation for Operation Plumbbob. A detailed description of the offsite radiological safety criteria is reproduced in the hearings before the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, May-June 1957, pages 248-258.

The radiation exposures onsite are normally accumulated in increments. Although great effort is made to hold the radiation exposures to as low a value as possible, these radiation doses may be deliberately incurred up to the maximum permissible limits, if the requirements of the test operation are imperative.

For the offsite general populace, the basic philosophy is to hold the radiation exposures to an absolute minimum. Past experience has shown that because of the very nature of the phenomenology of fallout the higher exposures to communities around the Nevada test site have resulted from a single or very few occasions of fallout. As the tests have progressed close scrutiny has been kept of these exposures in all communities. If any locality showed a significantly higher than average amount of fallout, that area was avoided when planning future detonations.

The reason for proposing any radiation exposure number for the general populace is for guidance to the test organization. In their deliberations before each detonation the advisory panel of the test organization make careful estimates of the most probable patterns of fallout. Since such predictions cannot be guaranteed to be precisely correct, estimates are also made of what might be the worst consequences in the unlikely event these predictions prove to be quite incorrect. It is under these worst conditions that it is said that the predicted fallout should not result in an exposure greatly in excess of 3.9 roentgens.

The record for radiological safety for the Nevada test site speaks for itself. The following is quoted from the congressional hearings mentioned above (pp. 180-181).

"* * * the highest fallout level noted to date in an inhabited place around the Nevada test site occurred in 1953 at a motor court near Bunkerville, Nev., where about 15 people might have accumulated 7 to 8 roentgens if they had continued to live there indefinitely."

The National Committee on Radiation Protection and Measurement has stated "* * * that individual persons not receive more than a total of accumulated dose to the reproductive cells of 50 roentgens up to age 30 years * * * and not more than 50 roentgens additional up to age 40 * * *"

Also, on page 181 of the congressional hearings it is stated "* * * the average exposure to only those communities around the Nevada test site that experienced the greatest amount of fallout (0.2 roentgens or more) is 0.6 roentgens for the 6 years since the regular nuclear tests were started * * * if the area considered around the Nevada test site is enlarged to include 1 million people the average exposure is 0.1 roentgens for the 6 years or at a rate of about one-half roentgen per 30 years. This is one-twentieth of the recommendation of the National Committee on Radiation Protection and Measurement for maximum exposures."

Operation Plumbbob (spring and summer 1957) did not materially change these values. There were no higher individual exposures offsite and the small fallout that occurred on some communities was balanced by the addition of the 1 year in the calculations, i. e., the rate remains about 0.1 roentgen per year for the communities with the highest exposures (about 100,000 people), and about one-half roentgen for 30 years for the 1 million people nearest to the Nevada test site.

We will be pleased to furnish you with any additional information you may desire.

Sincerely yours,

C. L. DUNHAM, M. D.,
Director, Division of Biology and Medicine.

Mr. ROBACK. On page 8 and page 9 of Mr. Corsbie's statement, is he in effect making a plea for continued bomb testing?

Mr. CORSBIE. As we have stated, the tests are useful in proof testing or validating laboratory and theoretical work. In general, until there is a proof test of theoretical concepts, there are uncertainties which could possibly be accepted, but utilizing the test is a means of refining information.

Mr. ROBACK. Somebody probably questions the contribution of test-made knowledge. Is this a statement with regard to the beneficial effects in book knowledge as it relates to human life in peacetime endeavor or is this a question of balancing the risks of knowing how to protect yourself against weapons as against not testing?

Mr. CORSBIE. There are some of both elements in it.

I might say with reference to your query that if a bomb or bombs could be detonated for the express purpose of gaining information on the effects, as contrasted with attempting to get effects information from developmental shots where yields are uncertain and there are many other uncertainties which reduce the probability of getting good information from the test—good effects information—then there is, in my opinion, my personal opinion, a need for tests for the benefits of mankind. If we say that gaining more information on the bio-medical effects of radiation, more information on shielding aspects, more information on blast biology and physical damage from blast, are representative criteria with which the tests are undertaken, then they are needed.

Mr. ROBACK. If there was no more bomb testing by international convention or otherwise, then the information would proceed by laboratory and developmental testing. In other words, you would try to learn as much as you could without explosions. Does that follow?

Mr. CORSBIE. There would be no other recourse. Insofar as investigations having to do with radiation are concerned, you would have to deal with artificial sources. If it were prompt radiation it would be a matter of sources that would be used in single or multiple locations. If it were a matter of fallout to be investigated, it would be by simulants distributed over an area. Relative to thermal and blast, I think the thermal could be handled fairly well through current laboratory techniques and capabilities, and blasts in a somewhat less satisfactory degree.

Mr. HOLIFIELD. The testing of small bombs in Nevada does give you the opportunity to extrapolate, does it not, on higher pounds per square inch pressure and higher degrees of intensity of radiation?

Mr. CORSBIE. Yes, sir. The one area in which information is especially needed is in a correlation between low yield and high yield bursts or, as you have stated, extrapolating from low yield of kilotons to megatons, or fractional kilotons to megatons.

Mr. HOLIFIELD. This is getting a little bit afield from the purpose of the investigation, but the information which is needed for human protection against nuclear weapons can be obtained, in the main, by the testing of smaller weapons without the necessity of testing the megaton-type weapon, is that not true?

Mr. CORSBIE. Yes. Progress can be made. I would hesitate to try to say exactly in what degree, but certainly a test of small-yield weapons provides, for instance, massive, instantaneously delivered doses of radiation which are not obtainable within a laboratory. It also provides certain blast effects, although of short duration, that are not obtainable in laboratory shock tubes or wind tunnels in the same way.

Mr. HOLIFIELD. Unless there are further questions, we will proceed with your witnesses, Mr. Corsbie.

Mr. CORSBIE. Mr. Chairman, the next item will be covered by Dr. Paul Tompkins who was originally Director of program 32 of the civil effects Plumbbob test, a study dealing with countermeasures and decontamination.

After the program was well launched, Dr. Tompkins was compelled to withdraw as Director but was able to remain as a consultant. The operational responsibilities were given to Dr. Miller of his staff. Dr. Tompkins will cover the radiological shelters.

Mr. MINSHALL. Mr. Chairman, before we proceed with Dr. Tompkins, I would like to ask Mr. Corsbie one question if I may.

Mr. HOLIFIELD. Go ahead.

Mr. MINSHALL. You mentioned on page 8 of your statement:

We need to know on a continuing basis about the ways in which blasts, heat radiation, and light and so forth and radioactive fallout affect people and food.

You say these can be conducted, as far as blast and heat are concerned, pretty accurately and satisfactorily on a laboratory basis.

Why could the others not be conducted on a laboratory basis?

Mr. CORSBIE. I thought I said that we could make progress in the laboratory. It would be less efficient and our information would remain less certain. In other words, there would be many more uncertainties in it. But somewhat like the technology associated with many of our other needs of life, say, in putting up this building, we continue to study, we need to know more and more about it, but at almost any stage after initial data is established, with some risk or based on judgment, one can proceed to use that information.

The intent here was merely to point out the need for continuing study. It is not a static subject, but a dynamic one. I doubt that we would ever reach a stage where we could say we know all about anything.

Mr. MINSHALL. As counsel has pointed out then, you feel there is a need to continue bomb testing?

Mr. CORSBIE. Yes, sir. I thought this was clear. I tried to emphasize that insofar as effects are concerned more rapid progress could be obtained if people responsible for the effects tests could use weapons of known characteristics. Then one could predict the radiation, the blast, and the thermal and could investigate more precisely the various parameters that are under study.

Mr. MINSHALL. It is your considered opinion then, Mr. Corsbie, that you could continue these bomb tests at Yucca Flats and the other

areas you have out in Nevada, on a clean bomb basis without any effect on the surrounding countryside?

Mr. CORSBIE. We could certainly conduct them within our present operational criteria.

Mr. MINSHALL. What do you mean by that?

Mr. CORSBIE. Well, I mean by operational criteria that before any operation, a great deal of study is given to what will or what will not hurt off-site population. After we have established the criteria with such margin of safety, no damage should occur.

Mr. MINSHALL. What would be the ultimate procedure that would not be in your operational criteria? Going in the other direction, what would happen? You do not believe these tests can be conducted in a safe manner, then?

Mr. CORSBIE. I think the whole history of tests at Nevada indicates that they can be and have been conducted in a safe manner.

Mr. MINSHALL. You sort of qualified it though in response to the question I just previously asked. You said within our operational criteria. What was the implied qualification?

Mr. CORSBIE. Our operational criteria are regarded most seriously by the Atomic Energy Commission and any findings such as those that have come from the National Academy of Science and National Research Council are duly examined by the Atomic Energy Commission in establishing the operational criteria for any nuclear detonation.

We always try to make full use of what is being recommended by competent councils, authorities, or individuals and to incorporate such guidance into operational criteria which is written for each series.

Mr. MINSHALL. Do you feel you have enough technical information to go ahead on a nationwide shelter construction program that would be adequate, based on the tests to date?

Mr. CORSBIE. I think there is enough information now to start a program on fallout shelters, or on shelters against blasts. I do not think we have enough information to warrant the discontinuance of future investigation.

Mr. MINSHALL. We have enough information though from a civil defense viewpoint on the tests we have already conducted; is that not so?

Mr. CORSBIE. To start a program. That is my opinion.

Mr. MINSHALL. Then no further testing is necessary as far as the civil defense point of view is concerned?

Mr. CORSBIE. I did not intend to imply that. We have enough information to initiate a program. We can say, "This shelter will accomplish this objective in fallout protection." That "This will be accomplished as to blast protection."

I would be the first to say that in my opinion our knowledge is not complete and we need to continue to study. I am not sure now that we can design the most economical blast shelter or perhaps the most economical fallout shelter. I think it is important to continue to study this to see whether or not it is costing more than is actually needed to accomplish the objective. This is what I mean by enough information.

Mr. MINSHALL. In other words, you do not believe it would be wise to start on a nationwide shelter program at this time until we have further data?

Mr. CORSBIE. I think we are in good enough shape, relative to data, for experienced engineering people and biomedical people to come up with designs for fallout and blast shelters that would accomplish the objectives as I see them now.

Mr. MINSHALL. Then why is more testing necessary if you have all the information now?

Mr. CORSBIE. It is the further refinement of the information.

Mr. MINSHALL. That is all I have.

Mr. HOLIFIELD. It seems like to me the burden of your testimony is that the field of information is never complete and that new types of weapons, new hazards, will create new problems, and that there will always be need in any scientist's mind to explore further the realm of the unknown.

Your explanation of criteria, it seems to me, might be clarified by saying that if the National Academy of Sciences set, for instance, 300 milliroentgens as being the allowable off-site exposure, you set that up as a criteria and the sizes of your bombs and the weather conditions and the height at which it is exploded and all of these things are made to conform to the safety factor rather than to other factors which might ignore the safety factor which has been set by the best medical and scientific advice.

Mr. CORSBIE. That is substantially correct.

Mr. HOLIFIELD. In other words, the safety of the general population and the protection of the population against an excessive dosage is your basic criteria. Upon this you start building the rest of your testing criteria?

Mr. CORSBIE. That is correct; yes, sir.

Mr. HOLIFIELD. So the public can be sure you start not from the base of the size of a weapon you wish to explode, but you start with the base of the allowable off-site exposure and the allowable exposure to the personnel who are in close proximity?

Mr. CORSBIE. That is correct.

Mr. HOLIFIELD. Dr. Paul Tompkins, who is before us this morning—I would just like to say this for the benefit of the subcommittee—is an old friend of mine and an acquaintance of many years' standing. He is the scientific director of the Naval Radiological Defense Laboratory located at Hunters Point, Calif. This is a laboratory which has, I believe, up to a thousand people working in it. Is that not true, Dr. Tompkins?

**STATEMENT OF DR. PAUL C. TOMPKINS, SCIENTIFIC DIRECTOR,
UNITED STATES NAVAL RADIOLOGICAL DEFENSE LABORATORY,
AND DIRECTOR, CETG PROJECT 32**

Dr. TOMPKINS. It is closer to 600, Mr. Chairman.

Mr. HOLIFIELD. And you have been in existence since the 1946 tests in the Pacific?

Dr. TOMPKINS. That is right.

Mr. HOLIFIELD. This laboratory is looked upon as the most authoritative source of radiological knowledge in the nuclear field in existence in the world today and Dr. Tompkins, within the scientific profession, has as high standing as any man in the world with regard to the types of laboratory experiments which have been conducted by our country during the 12 or 13 years we have been exploding these weap-

ons. He was recently special consultant to the Joint Committee on Atomic Energy in connection with a special subcommittee study of radiation.

You may proceed, sir.

Dr. TOMPKINS. I would request your permission to withhold my story until Mr. Vortman and Dr. Harris have given the blast and biological effects. If this is satisfactory, I would like to request a change in order.

Mr. HOLIFIELD. Very well. Would you like to have Mr. Vortman or Dr. Harris?

Mr. CORSBIE. May I suggest Mr. Vortman?

**STATEMENT OF LUKE VORTMAN, DIRECTOR, CETG PROGRAM 34,
SANDIA CORP.**

Mr. VORTMAN. Mr. Chairman and gentlemen, I have just given to Mr. Corsbie to give to you a prepared statement from which I will read most of my remarks.

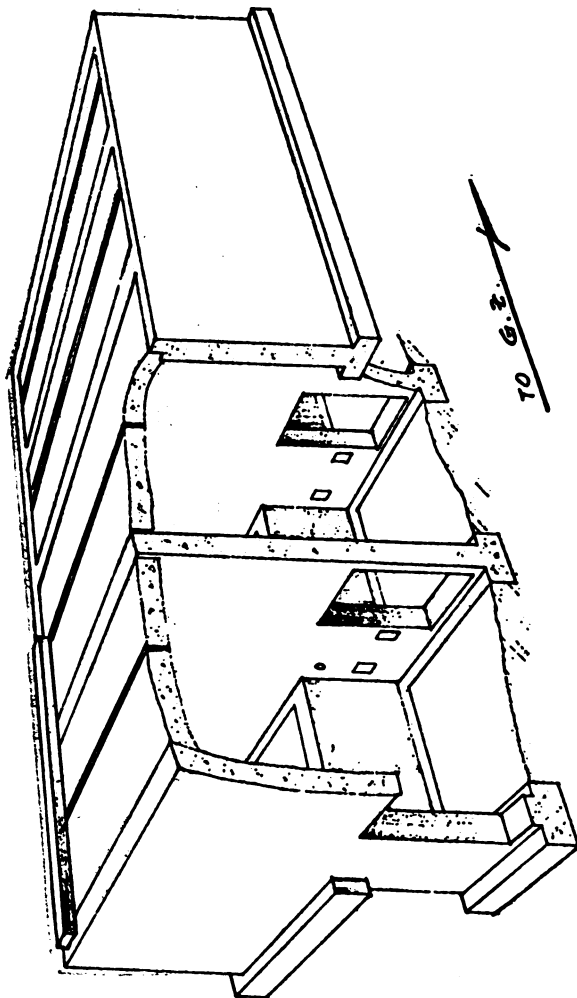
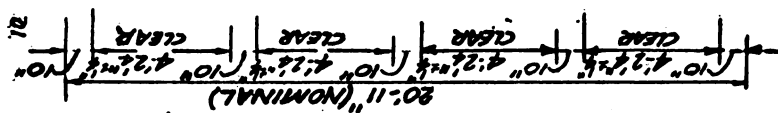
It is my purpose here to present the results of the CETG program 34 Plumbbob experiments, together with some pre-Plumbbob experiments that best illustrate certain points regarding the physical effects of blast.

While the projects cited are from full-scale tests, most have been supplemented by laboratory or small-scale experiments which have been more enlightening than the full-scale tests in many cases.

APPLICABLE FULL-SCALE EXPERIMENTS

Ground-level structures: Operation Plumbbob project 34.2. The purpose of project 34.2 was to evaluate the relative merits of rail steel and intermediate-grade steel for reinforcing blast-resistant reinforced concrete structures. It is not known at this time which steel is better. Nevertheless, the experiment is worth describing because it illustrates the precision with which blast loading and structural response can be predetermined.

Half of the reinforced concrete slabs constructed were reinforced with rail steel and half with the intermediate grade. Pairs consisting of both types were placed as shown in figure 1.



PERSPECTIVE VIEW

FIGURE 1.—Reinforced concrete slabs reinforced half with rail steel and half with intermediate grade.

Each pair was isolated from the others so that a failure of one pair would not relieve the blast loading on adjacent pairs. Blast seals were placed around the periphery of each slab to prevent pressure leakage to the inside of the chamber.

The intent was to have blast loading on only one side of the slab. Actually some pressure did exist on the underside, because the deflection of the slab compressed the air inside the chamber. The chamber was constructed with the slabs at ground level so that the blast loading would be free from the uncertainties of diffraction, that is, the blast loading on the slabs was the same as that measured by a pressure gage placed at the ground surface.

The physical results of the experiment are shown in figure 2.

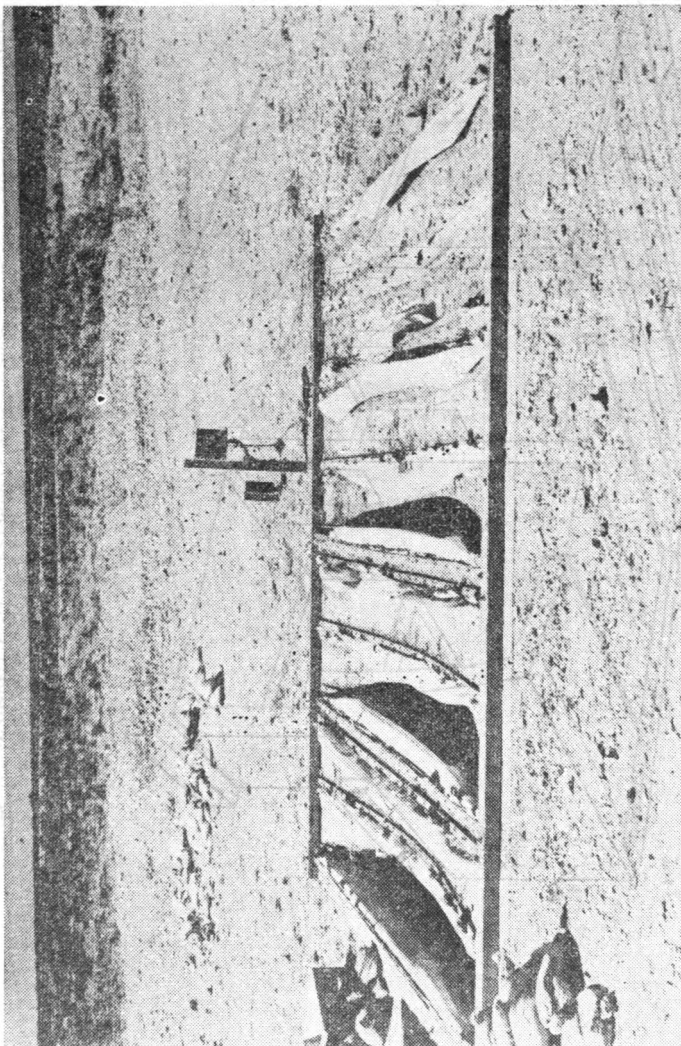


FIGURE 2.—Table 3.1. Station 8-34.2-8017.01 postshot.

The forward pair was designed for the expected yield; the remaining pairs, to cover uncertainties in yield.

Mr. HOLIFIELD. How thick were those slabs?

Mr. VORTMAN. They were 10 inches thick.

Mr. HOLIFIELD. Were they reinforced with steel?

Mr. VORTMAN. Yes. In each pair one of the slabs was reinforced with rail steel and the other reinforced with intermediate grade steel.

Mr. HOLIFIELD. What was the pressure per square inch?

Mr. VORTMAN. Somewhere on the order of 7 pounds per square inch.

Mr. HOLIFIELD. Could you tell us offhand what that pressure was in relation to the size of the weapon and the distance from the weapon or do you have that information?

Mr. VORTMAN. I do not have that. The yield has been announced, however, as 43 kilotons.

Mr. HOLIFIELD. Could you give an approximation of the distance?

Mr. CORSBIE. I do not recall the distance. We can get that for you.

Mr. HOLIFIELD. Was that an air shot?

Mr. VORTMAN. It was a tower shot.

Mr. CORSBIE. It was on a 700-foot tower. It was the so-called Smoky shot. It was announced as 43 kilotons.

Mr. HOLIFIELD. Just about twice the size of the Hiroshima-Nagasaki bomb?

Mr. CORSBIE. Yes, sir.

Mr. HOLIFIELD. If you will furnish the distance on that it will give us some idea of what it means.

Mr. VORTMAN. We will provide you with the distances.

(The following information was subsequently received:)

The distance at which the Plumbbob project 34.2 was located at 7 pounds per square inch was 4,200 feet.

Mr. HOLIFIELD. Three feet of dirt over that would have increased the protection from a blast standpoint? I know it would from radioactivity.

Mr. VORTMAN. Three feet of earth certainly would have. However, it would have decreased the accuracy with which we could have predicted the deflection of the slabs. We were trying in this experiment to achieve maximum deflections because we wanted to better understand the behavior of the two types of slabs.

Mr. HOLIFIELD. Now, let me ask you, if that had been in the form of an arch, would you have had a stronger surface there and more resistance than as constructed?

Mr. VORTMAN. I am sure an arch shape would have been stronger. However, it would not have been compatible with the purposes of this particular experiment.

Mr. HOLIFIELD. All right. Proceed.

Mr. VORTMAN. This slide illustrates the deflection of the slabs in the particular experiment.

FIGURE 3.—Table 3.4. Summary of slab deflections

Beam	Maximum centerline deflection (inches)	Permanent centerline deflection (inches)	Maximum centerline deflection predicted (inches) ¹
RCA.....	7.6	3.6	6.1
ICA.....	15.1	12.2	12.7
RW1A.....	17.8	6.5	8.5
IW1A.....	19.1	16.2	17.2
RW2A.....	13.4	8.3	12.5
IW2A.....	22.2	19.7	-----
RW3A.....	15.5	9.6	17.4
IW3A.....	>25.0	~25.0	-----
RCB.....	4.6	1.4	3.7
ICB.....	7.1	4.8	5.3
RW1B.....	6.3	3.0	4.4
IW1B.....	11.8	9.4	8.1
RW2B.....	6.9	4.3	5.8
IW2B.....	11.8	9.8	10.5

¹ Preshot predictions based on assumed material properties and pressure loading.

² Deflection exceeded gage capacity. The 25.0 is the permanent deflection measured with a steel tape

Mr. HOLIFIELD. What is the meaning of those figures? What does that register? Pounds per square inch?

Mr. VORTMAN. In the first column are the maximum centerline deflections in inches. In the second column the permanent centerline deflections in inches—that is, after it had gone through the maximum and recovered to an amount which was permanent deflection; and the last column is the maximum centerline deflection predicted prior to the shot, also in inches.

The slabs were designed for a predicted yield of 45 kilotons, with a spread between 40 and 50 kilotons.

The actual yield, 43 kilotons, was 5 percent less than the yield designed for. Consequently, the actual blast loading, as indicated by the impulse was 7.5 percent less than the computed for the predicted yield. These uncertainties being taken into account, the average actual deflection of all slabs was within 15 percent of that calculated for the pressure wave anticipated from the predicted yield.

Mr. HOLIFIELD. In making your testimony, try to identify for the record, in place of using such terms as “this column to that column,” use “first column to third,” and so forth, and also identify each one of these slides by your identification number, because we will ask you to supply us typed copies of these slides to place in our permanent record.

Mr. VORTMAN. Copies of the slides have been furnished with the statement.

Mr. HOLIFIELD. Then identify them in your testimony by whatever identification you have.

Mr. VORTMAN. Very well. The average maximum centerline deflections predicted prior to the shot, for the third column, are within 15 percent of the maximum centerline deflections in inches, measured after the shot, shown in the first column.

Two major points emerge from this experiment:

1. The blast loading produced on a structure by a device of known yield can be estimated quite accurately if the uncertainties of blast diffraction are eliminated, as they were in this experiment by using a ground-level structure.

2. If the blast loading is known accurately, the response of simple structures can often be calculated with a precision which is surprising to the layman.

It is now appropriate to go from ground-level structures to above-ground structures on which blast loading is complicated by the diffraction of the blast wave around the structure.

Aboveground structures—Operation Greenhouse, project 3.1.1: During Operation Greenhouse, the Office, Chief of Engineers, sponsored a three-story, aboveground structure with reinforced concrete, shear-wall sections, steel-framed sections, and reinforced-concrete-framed sections, figure 4.

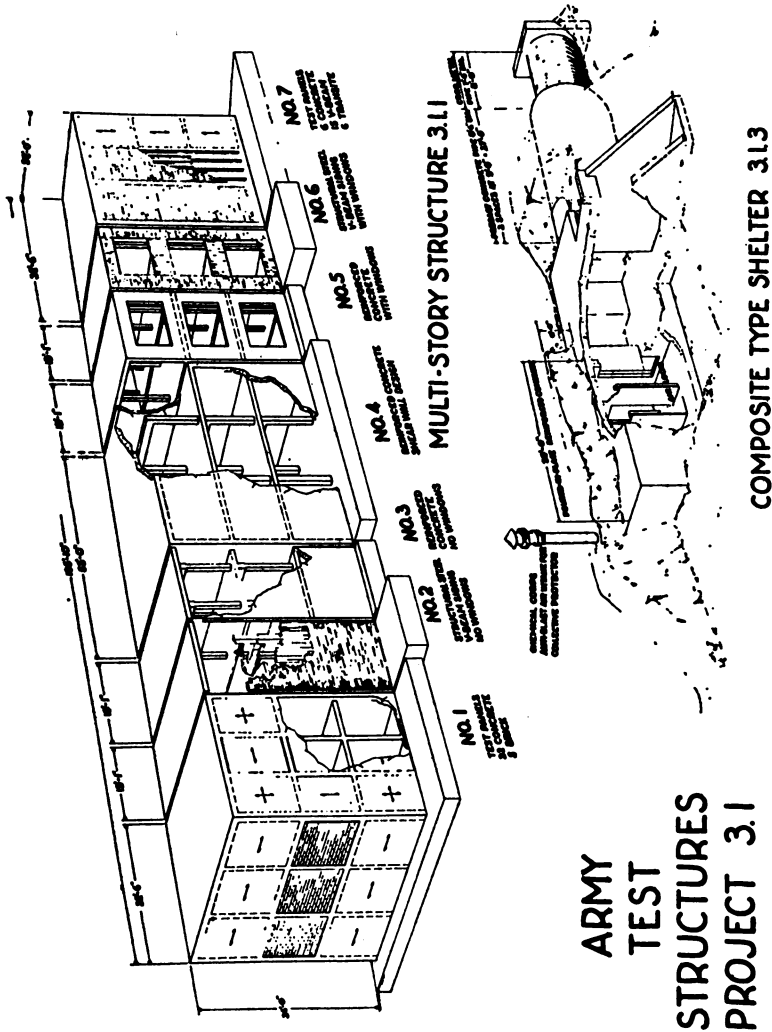


FIGURE 4.—Army test structures project 3.1.

The displacements of the roof, third, and second floors of the steel-framed building were calculated before the test by estimating blast loads, measured during the test, and were calculated after the test from measured blast loads.

Results can be summarized as below, the measured displacements being taken as unity:

	Preshot calculations	Measured	Postshot calculations
Roof.....	1.11	1	0.76
3d floor.....	.90	1	.63
2d floor.....	1.45	1	1.42

Section 2 was the structural-steel building. No. 3 was identical, but with reinforced-concrete columns and beams.

I have here the roof, third floor, and second floor, and have normalized the deflections or displacements of those floor levels. The preshot calculations for the roof deflection were 1.11 larger than the measured deflection. The postshot calculations, that is, calculated from the blast pressures measured during the shot, were three-fourths of the deflections measured. Results for the other two floors are as shown.

Thus, for a relatively complex structure, the calculated response with within 50 percent of the measured response. Calculations for the other six sections were in some cases better and in some cases worse than in the steel-framed sections.

Mr. HOLIFIELD. I think this shows clearly the difference between laboratory calculations and actual results. It shows, without doubt, if you wish to have accurate knowledge or information on a subject, that you must go through the actual test to put into proper perspective the validity of your calculations.

Mr. VORTMAN. Operation Teapot, project 34.1: At Operation Teapot, a series of aboveground, utility-type, personnel shelters were tested. Insofar as these were planned as dual-purpose structures, the concept was a step in the right direction.

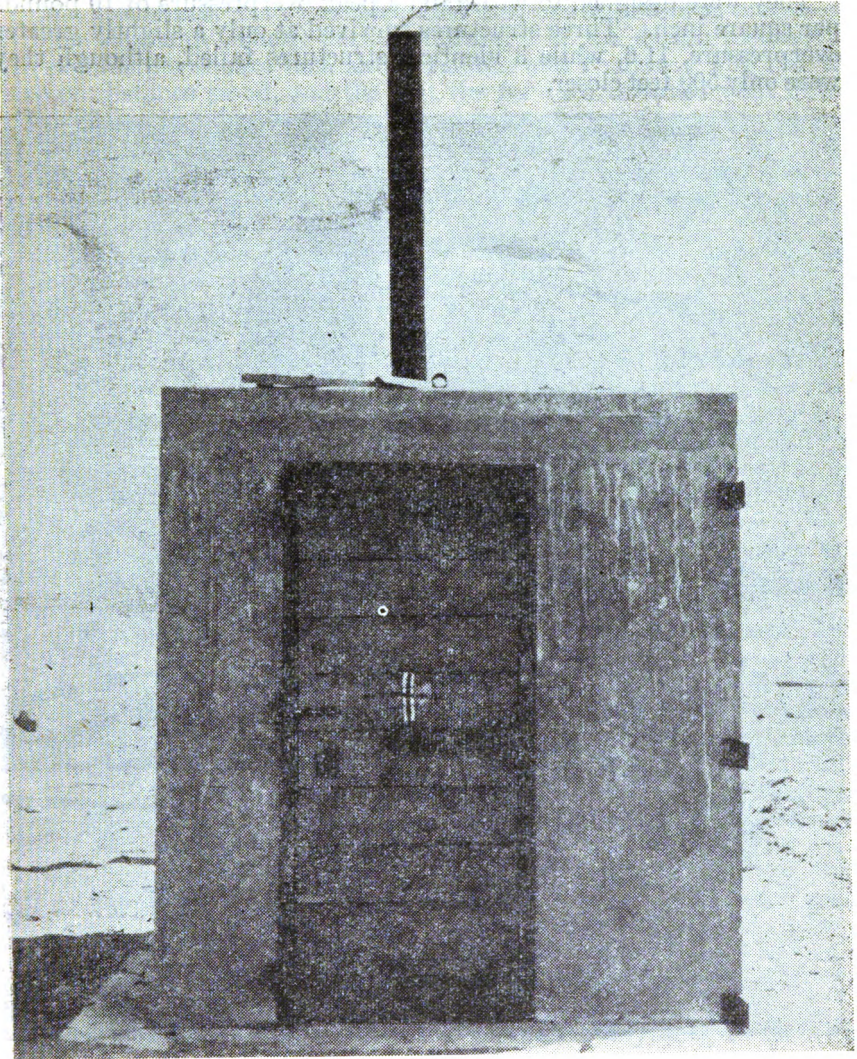


FIGURE 5.—Operation Teapot, project 34.1, test of aboveground, utility-type, personnel shelter.

They were designed to withstand a peak overpressure of 10 pounds per square inch. Three structures survived at only a slightly greater overpressure, 11.6, while 3 identical structures failed, although they were only 500 feet closer.

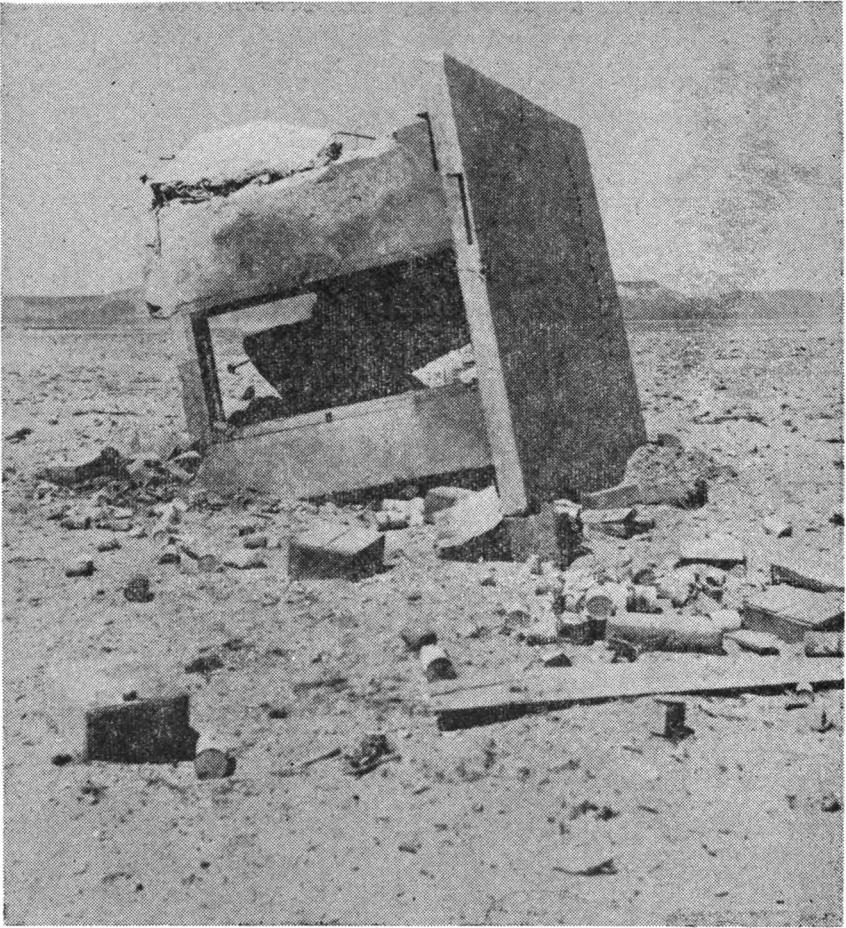


FIGURE 6.—Structure after a peak overpressure in excess of 11.6 pounds per square inch.

Mr. HOLIFIELD. Now, what pounds per square inch did you say this structure was subjected to?

Mr. VORTMAN. I do not have the pounds per square inch, but it was 500 feet closer than the shelters receiving 11.6 pounds per square inch. Now, this again is evidence of the precision with which the failure of structures can be predicted.

Mr. HOLIFIELD. If these were the same type shelters, it shows what the distance of 500 feet will do in the case of identical shelters.

Mr. VORTMAN. It also shows the precision at a short distance and 500 feet beyond.

Mr. HOLIFIELD. Had you calculated that this structure as shown—

Mr. VORTMAN. There were 3 stations, 1 at the design distance of 10 pounds per square inch and 1 further and 1 closer. The 1 at the design distance stood, and the 1 at the forward distance went down. This did, in fact, bracket the expected damage.

Mr. HOLIFIELD. Were they 500 feet apart?

Mr. VORTMAN. There was a distance of 500 feet between the first and second group, and a slightly larger distance between the second and third group.

Mr. HOLIFIELD. Do you have the pounds per square inch that the third group, the farthest away, was subjected to?

Mr. VORTMAN. That was about 7 pounds per square inch.

Mr. HOLIFIELD. In other words, it reduced—

Mr. VORTMAN. They were placed for 7, 10, and 13 pounds per square inch. The design was for 10 pounds per square inch, but they were placed for 7, 10, and 13 pounds per square inch.

Now, in passing, it is worth noting that some pressure did reach the inside of these structures. The peak overpressure inside the shelter was 35 percent of that outside. The structure also gave inadequate protection from radiation.

Mr. HOLIFIELD. They did what?

Mr. VORTMAN. They gave inadequate protection from prompt radiation.

Mr. HOLIFIELD. Do you have measurements on the external and internal radiation?

Mr. VORTMAN. We have measurements of the internal radiation intensity and the measurements of the outside were taken from three free-field measurements and interpolated between points of measurements at various distances.

Mr. HOLIFIELD. Could you give us the relative reduction of those two, the external to the internal, so we could get an idea of how much protection was afforded by the structure?

Mr. VORTMAN. I can give you that only for the prompt gamma. The ratio of the incident to the average inside was ranged between $1\frac{1}{2}$ and 2.8 so that it was a factor between $1\frac{1}{2}$ and 3 reduction.

Mr. HOLIFIELD. What thickness were the walls of that structure?

Mr. VORTMAN. I believe they were either 6 or 8 inches. They were 8 inches.

Mr. HOLIFIELD. Would a wooden door have anything to do with the high incidence inside?

Mr. VORTMAN. It probably had something to do with it. The wooden door, however, was not facing the source of the blast, it was side on to the blast.

Mr. HOLIFIELD. It would nevertheless be a factor of gamma penetration; would it not?

Mr. VORTMAN. It certainly would.

Mr. HOLIFIELD. It would contribute to a higher incidence inside?

Mr. VORTMAN. Yes.

Mr. HOLIFIELD. Did you have wooden doors in all instances?

Mr. VORTMAN. Yes; in each of these nine cases there were wooden doors.

Mr. HOLIFIELD. What was the reason for having wooden doors there in place of cement doors?

Mr. VORTMAN. In place of concrete doors?

Mr. HOLIFIELD. Yes.

Mr. VORTMAN. I think it was a matter of construction simplicity. If these were to be used by a family concrete doors would certainly increase the cost and the wooden doors did reduce, as I have indicated—did reduce the blast overpressure inside to about one-third of that outside, so they served an effective purpose in that sense.

Mr. HOLIFIELD. Yes; but if the incidence was still too high inside for safety, your economics defeated your purpose of the shelter.

Mr. CORSBIE. Mr. Chairman, partly in explanation, these tests were conducted on a shot of declassified yield and it was between 30 and 35 kilotons on a 500-foot tower so to get the overpressures then from that relatively low yield you had to come into a higher range of prompt radiation.

For a higher yield weapon, it might achieve this resistance to the overpressures, but be at such distance as to have a much lower radiation.

Mr. HOLIFIELD. I do not understand the pertinance of your remarks because it would seem to me that if I were testing a structure of that type I would test it with both cement doors and wood doors because the rest of your structure was cement.

Mr. CORSBIE. It would have been a good idea.

Mr. HOLIFIELD. I do know that you did have some heavy metal doors there on some other types of structures.

Mr. CORSBIE. That was in Plumbbob. This was in 1955. This was really a test against blast and not radiation.

Mr. HOLIFIELD. I see.

Proceed.

Mr. VORTMAN. Another dual-purpose above-ground shelter was a reinforced-concrete bathroom shelter designed to withstand 5 pounds per square inch. The bathroom of an ordinary 1-story rambler house was built with 8-inch-thick reinforced-concrete walls, ceiling, and floor. Blast-resistant door and window shutters were provided.

The exterior is shown in the next slide (fig. 7). Before the shot. This shows only the outside of the house with the shutter in place. The following slide (fig. 8) shows the same view from the outside with the shutter having been opened. The house was completely demolished. The glass in the inside window was not broken at 5 pounds per square inch, so that was satisfactorily protected by the blast shutter.

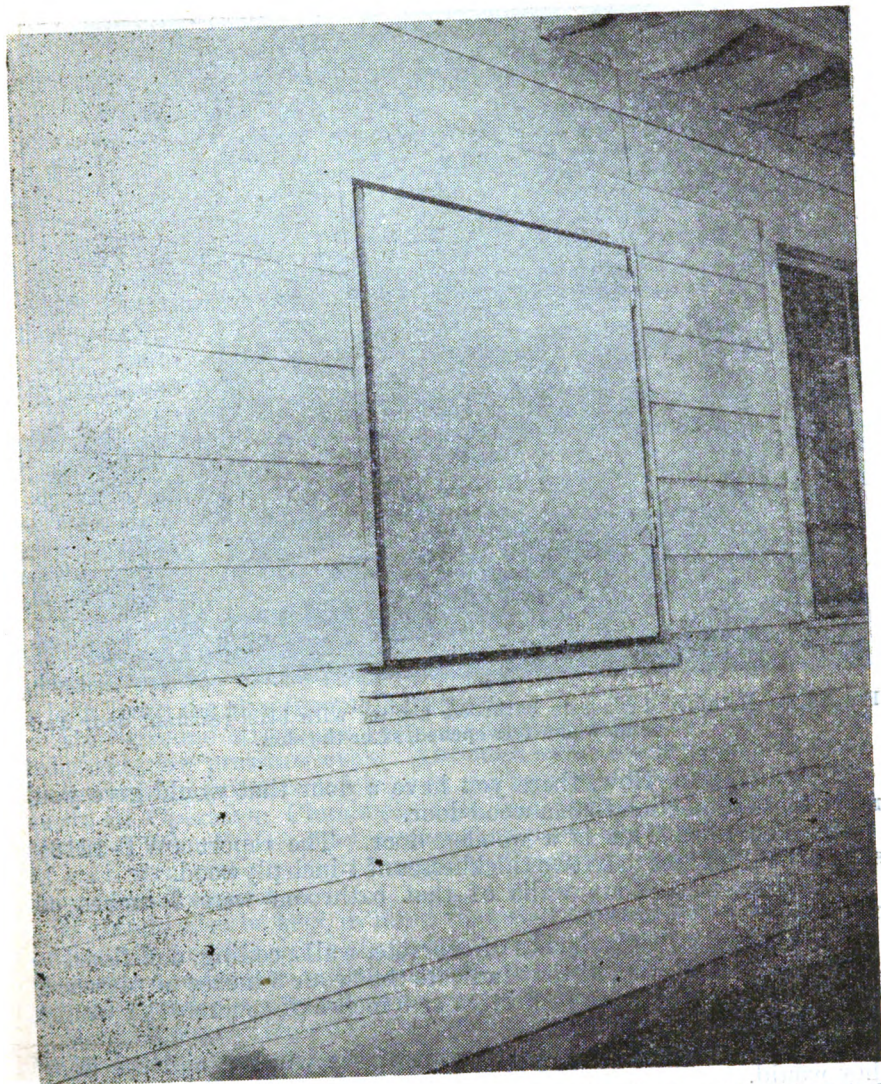


FIGURE 7.—Reinforced-concrete bathroom shelter with blast-resistant door and window shutters designed to withstand 5 pounds per square inch, before the shot.

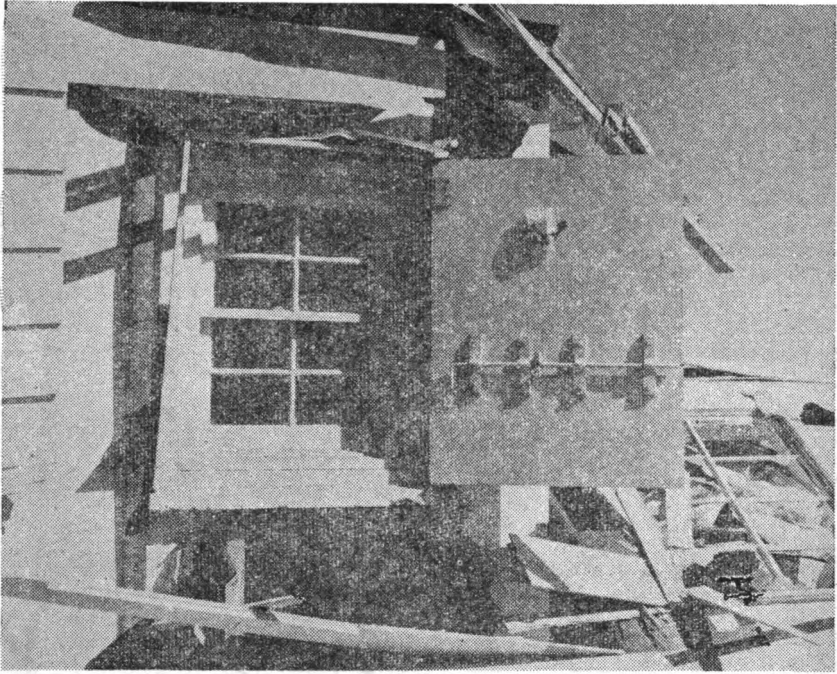


FIGURE 8.—Reinforced-concrete bathroom shelter with blast-resistant door and window shutters opened, after the shot.

Mr. HOLIFIELD. Now, there you have a door that would give you much more protection than a wood door.

Mr. VORTMAN. This is a wooden door. The report (WT-1218) shows the thickness to be two thicknesses of 1-inch plywood.

Mr. HOLIFIELD. Your walls of that bathroom were 3 inches of concrete.

Mr. VORTMAN. Eight inches of concrete, walls, ceiling, and floor.

Mr. HOLIFIELD. Would that indicate that your 3-inches of plywood would give you the same protection as 8 inches of concrete? I would not suppose that it would.

Mr. VORTMAN. Over the short span of the window and the door they would.

Mr. HOLIFIELD. As far as gamma penetration is concerned, they would not serve the shielding purpose like concrete?

Mr. VORTMAN. There again the shielding was about the same as in the shelters discussed earlier.

Mr. HOLIFIELD. Did you have a reading on the roentgens of exposure in those?

Mr. VORTMAN. I have again the shielding factors that I had before. The shelter reduced the prompt gamma radiation to only one-quarter of that outside.

Mr. HOLIFIELD. Give it to us in the number of roentgens, if you have it, as well as percentagewise.

Mr. VORTMAN. The levels inside were of the order of 25 to 50 roentgens.

Mr. CORSBIE. And that was at 4,700 feet. Just short of a mile from the bursts I mentioned earlier; 30 to 35 kiloton.

Mr. HOLIFIELD. Well, you could survive with a 25- to 50-roentgen dose. You might lose a few white corpuscles, but it certainly would not induce a sickness that would be fatal.

Mr. CORSBIE. That is right. I mention that this was a shelter in which there were 2 animals which were taken out within 2 hours after the burst and apparently were undamaged.

Mr. HOLIFIELD. What did their blood count read, do you know?

Mr. CORSBIE. No, sir; I do not have that information.

Mr. HOLIFIELD. There was an appreciable decrease of blood cells, I suppose?

Mr. CORSBIE. Well, that was a pretty low level of radiation, but there might have been.

Mr. VORTMAN. The maximum pressure inside these same shelters was one-quarter of the maximum overpressure measured outside of the shelter.

At this point I would like to mention some of the disadvantages of aboveground structures. The most important is that while most structures are designed to carry vertical loads, few, except earthquake-resistant structures are designed to take any significant lateral loads.

In addition, blast pressures are even greater on structures built with vertical walls above ground than on those built flush with the ground, because of the reflected overpressure and the drag pressure which loads the aboveground structure.

Aboveground structures, then, are economically practical only for relatively low pressure levels. Although such structures can be made to resist high pressure levels as in the reinforced-concrete protective vault in Operation Plumbbob—this was project 30.4, and perhaps someone from FCDA may discuss that particular project—the costs of such structure are high enough to discourage their use except for very special structures.

It should also be kept in mind that aboveground structures do not ordinarily provide adequate protection from prompt radiation. In most cases, adequate radiation protection can be furnished only by providing adequate earth cover and a suitable entrance detail.

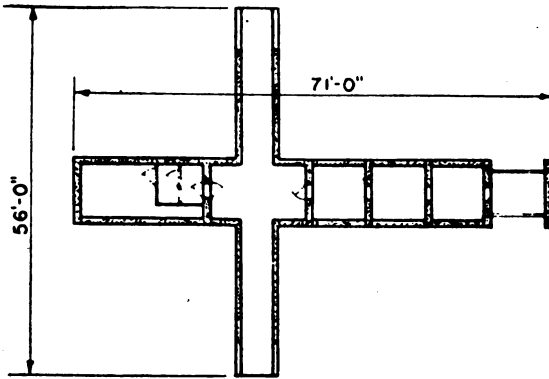
Mr. HOLIFIELD. However, there are areas in our country where the water level is so high in the ground that it would probably be necessary to have structures above ground, if structures were planned, and in those cases different shapes of structures would be needed. I am thinking of the quonset hut, arch-type structure. The mounding of earth over such a structure would give aboveground protection which would help to compensate for these factors you have mentioned.

Mr. VORTMAN. That is certainly right.

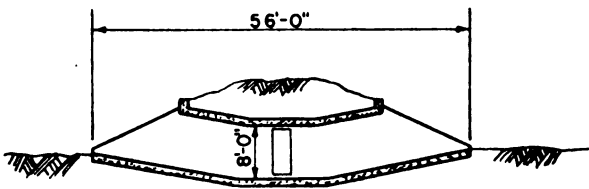
Mr. HOLIFIELD. Was not this proven in subsequent tests?

Mr. VORTMAN. It has been and I will go right into that in the following example.

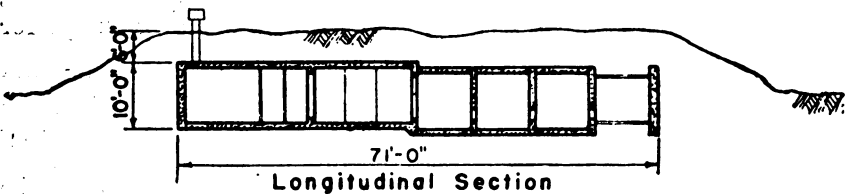
The first of these examples I want to show is a shelter sponsored on Operation Greenhouse by Office, Chief of Engineers, and it is shown in figure 9.



Sectional Plan



Transverse Section



Longitudinal Section

PERSONNEL SHELTER

FIGURE 9.—Personnel shelter.

Mr. HOLIFIELD. What year?

Mr. VORTMAN. 1951.

This structure consisted of one end of rectangular reinforced concrete construction, the other end of circular reinforced concrete pipe and then on the very end, one section of corrugated metal pipe.

The structure was partially above ground and covered with 6 feet of earth, as you can see in the transverse section and the section below. The shelter was satisfactorily tested and resisted between 50 and 70 pounds per square inch.

The loading of the structure by the earth cover was not as clearly defined as the one I want to show in the following project.

Mr. HOLIFIELD. Did you have distances on that, by the way, from this shot and also the kiloton yield?

Mr. VORTMAN. There again I believe the yield of that shot is still classified, is it not, Mr. Corsbie?

Mr. CORSBIE. Yes.

Mr. HOLIFIELD. Now, let me ask for the record, why should the yield of that shot be classified?

Mr. VORTMAN. That is a question I certainly am not prepared to answer. People dealing with weapons development would have to answer a question of that type.

Mr. HOLIFIELD. All right.

Mr. VORTMAN. I might point out, however, in passing, with regard to questions on the overpressure that if a yield is classified, then the overpressure and distance combination are also classified because one can infer the yield, knowing the overpressure and the distance.

Mr. ROBACK. Mr. Corsbie, may I ask before you proceed, the explosions of these test shots were developmental in the sense that they were designed to test the weapons rather than to test the shelters? Therefore, you could not necessarily get the information you wanted and you could not declassify it?

Mr. CORSBIE. That is correct. These are weapons developments shots as contrasted with weapons effects.

Mr. ROBACK. The weapons effects people are the orphans in these experiments. They are designed for other purposes and you have to hook in the best way you can. Is that not right?

Mr. CORSBIE. That has been generally the pattern followed.

Mr. HOLIFIELD. Notwithstanding the fact that this was primarily for developmental purposes, the scientific knowledge as to pressure per square inch and intensity of radiation could be determined subsequent to the shot and therefore related to the effect upon structures and animals within those structures, could it not?

Mr. CORSBIE. As a matter of fact, it was measured at the time.

Mr. HOLIFIELD. So while you did not predetermine exactly what would happen, postoperation, you could determine what had happened?

Mr. CORSBIE. Yes, sir, that is correct, and it is clear that if, for instance, the yield of a device were known, the reasons for testing it would be quite marginal. So usually there is a best guess from the people who are responsible for the design, as to the yield, but there is no assurance that it would be correct and therefore where you have to construct a building or a shelter, you may or may not receive the pressure that you need in order to have a successful effect experiment. It may be too high. So much so that you simply crush your structure or it may be so low as not to give you a test.

Mr. VORTMAN. The next structure was a Navy-sponsored project and consisted of a 25- by 48-foot semicircular arch of 8-gage multi-plate corrugated steel.

The foundation was at natural grade, and the arch had an earth cover about 3 feet thick over the crown with sides sloping at about 35 degrees. That was on the 1955 tests.

I show the inside of it in this slide (Fig. 10). The damage to this structure was produced by a shock wave with a maximum overpressure between 30 and 35 pounds per square inch.

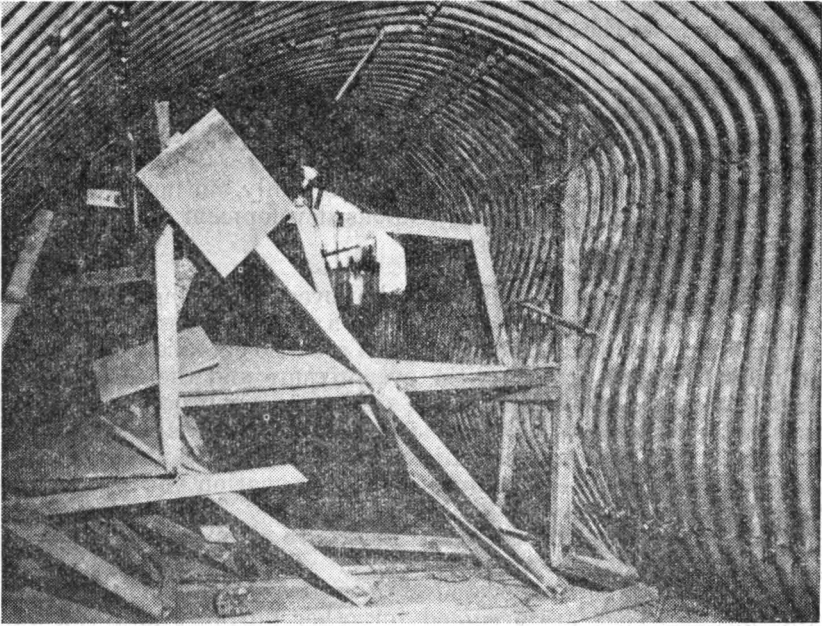


FIGURE 10.—25- by 48-foot semicircular arch of 8-gage multipleplate corrugated steel showing damage by a shock wave.

Mr. HOLIFIELD. That is above ground, is it?

Mr. VORTMAN. Yes. The floor of the structure is at natural grade.

Mr. HOLIFIELD. And the lumber structures in there are for the purposes of your testing devices and not for any other reason?

Mr. VORTMAN. That is right. They are not structural.

Mr. HOLIFIELD. Were the ends open on this structure?

Mr. VORTMAN. No, the ends were closed. The structure was completely closed so far as blast pressure entering the inside was concerned.

The deformation of this structure is shown in a diagrammatic way in the following slide (fig. 11).

You can see the difference between the original, predicted and actual deflections.

The damage occurred to the forward side of the structure simply because a covered structure which is above ground is subject in some measure to the same diffractive and drag loading as any above-ground structure. However, earth cover allows a structure to withstand a much larger overpressure than usual because of these reasons.

Mr. HOLIFIELD. What was your pounds per square inch pressure on that structure?

Mr. VORTMAN. Between 30 and 35.

Mr. HOLIFIELD. That had no dirt over it?

Mr. VORTMAN. This had 3 feet of earth over the crown. The earth cover allows the structure to withstand a larger overpressure for these reasons.

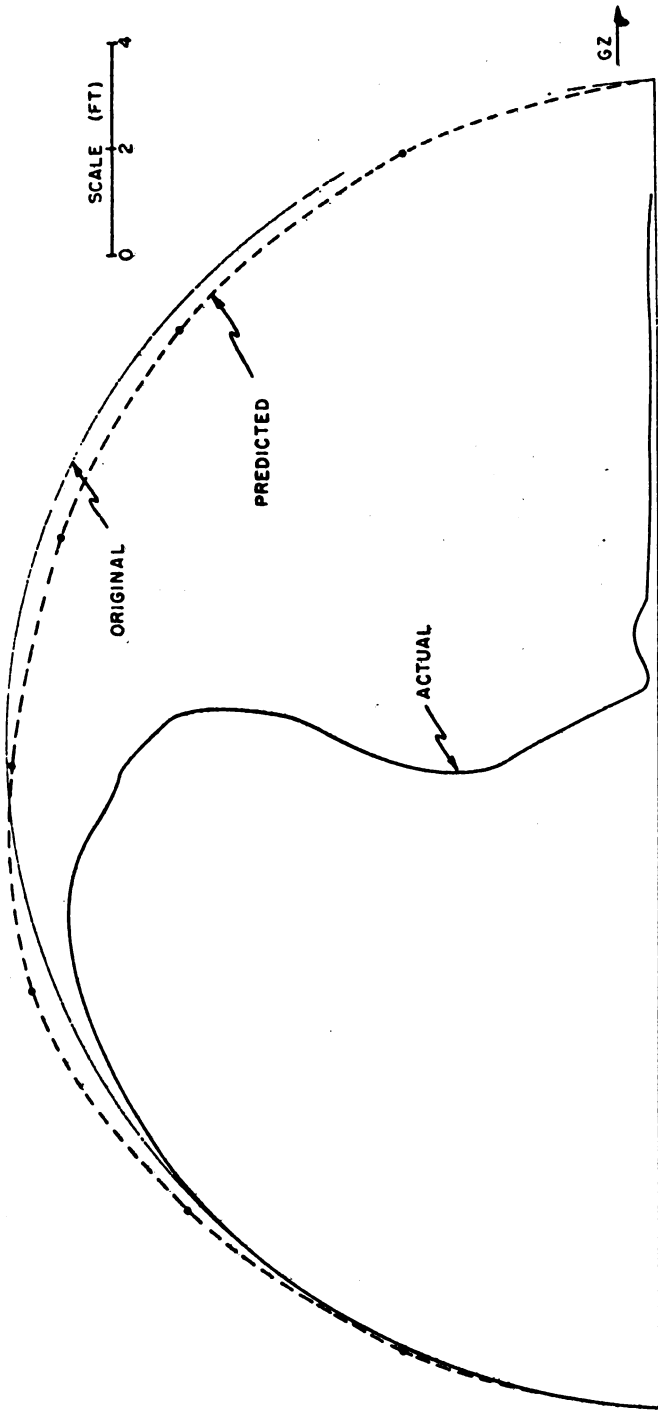


FIGURE 11.—Predicted and actual final profiles of semicircular arch.

First, both diffractive and drag loads decrease with the slope of the cover; they are maximum for a structure with vertical sides and zero for a structure which does not stand above grade.

Or, if the earth fill over the structure is the part that is above-ground, they are maximum with an earth cover with a steep slope, minimum with an earth cover with a low slope.

Second, some of the force must be expended to move a mass of earth before the earth can apply force to the structure.

Third, the earth itself is capable of carrying load if it is thick enough and has been sufficiently compacted to arch over the structure and carry a part of the load.

One of the conclusions resulting from this project was that a shelter should be completely buried to obtain maximum blast protection from a minimum thickness of earth cover. In other words, if you want a combination of minimum thickness and maximum protection, then you should go completely below ground.

With that, I want to go into below-ground structures.

On Operation Plumbbob, project 34.3, that consisted of the test of 2 buried 7-foot-diameter 10-gage structural-plate pipes, each of these 20 feet long. They were buried so that the grade was 10 feet above the crown of the pipe and were placed to be subjected to overpressures of 195 and 265 pounds per square inch.

The purpose of the tests was not to evaluate multiplate pipes as personnel shelters, but rather to check their effectiveness as an inexpensive alternate to the expensive reinforced concrete tunnels required for certain test facilities.

For test purposes, the pipes could be permanently deformed, as long as deformations would not prevent restricted access through the pipe tunnel.

In other words, for the purpose for which these were designed, they could have been significantly deformed provided afterward people could still get through them.

Unfortunately, the desired deformations were not achieved because the overpressures were less than anticipated and because the arching action of the soil may have been greater than expected. Actual deformations—all less than 1 inch—probably would be acceptable for a personnel shelter, although not suitable for areas with a high water table. Neutron radiation was not measured inside the pipes, again because they were not intended as personnel shelters; gamma radiation inside the pipes was well within the acceptable limits.

If used as a shelter, these pipes, since they were only 20 feet long, could accommodate not more than 10 persons.

It should be emphasized that the blast loading transmitted by earth on belowground structures is very difficult to predict, even though the air blast pressure at the ground level is accurately described.

The reasons for this difficulty in predicting soil pressures are:

- (1) The grossly different characteristics of various soils,
- (2) The fact that there are few truly homogeneous soils even for a single soil type,
- (3) Differences among soils in the extent to which cementation occurs—that is cementation ordinarily increases with the time the structure has been buried—and
- (4) Significant variation with time of moisture content, a major variable affecting transmission of blast loading.

Blast loading will be carried through saturated soils rather than those with low water content.

Even with these uncertainties, blast loadings can be predicted with adequate accuracy. A procedure for estimating this type of loading, as well as those discussed earlier, is covered in an excellent FCDA publication—I refer here to their TR-5-1 published in January of this year, Recommended FCDA Specifications for Blast Resistant Structural Design Method “A.” This presents the information in a form which is suitable for use by the average engineering firm.

While the procedures described in the publication for estimating the loading are not as refined as they might be, I want to emphasize that they are as refined as they need be, at this time.

I will get into that point a little later.

I want to go back to Operation Teapot (1955) for one more below-ground structure. This was an underground group shelter sponsored by FCDA on Operation Teapot (1955) and the planned view sections are shown in the following slide (fig. 12).

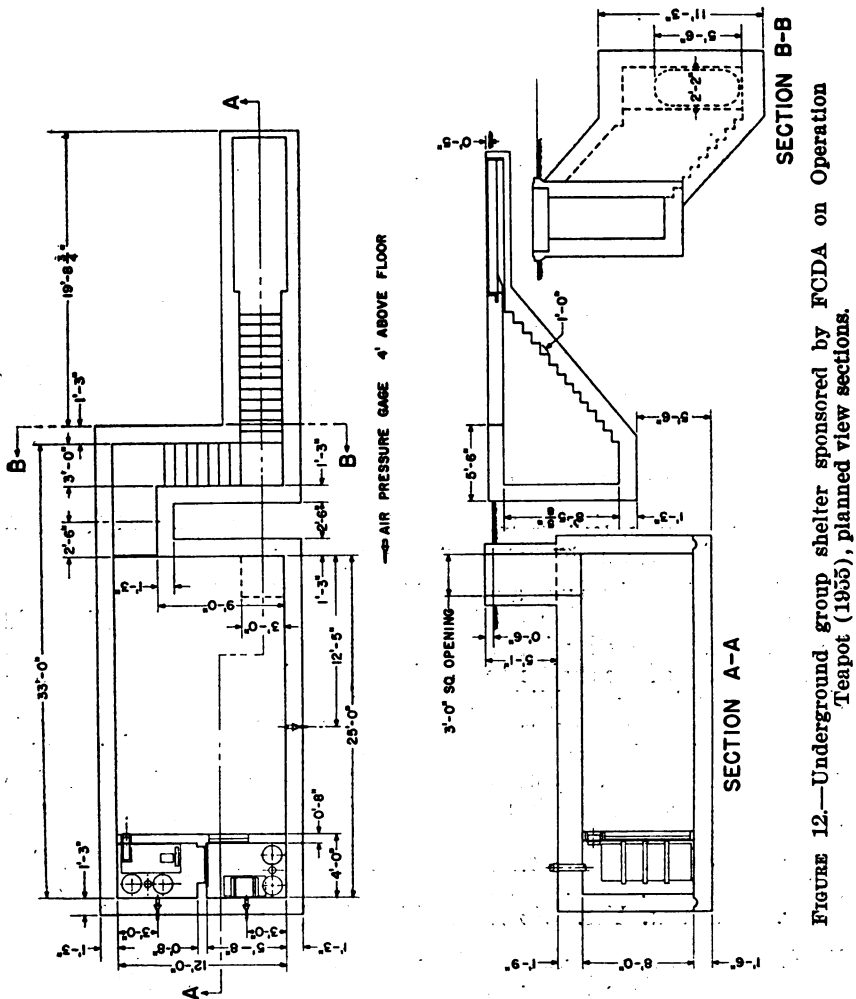


FIGURE 12.—Underground group shelter sponsored by FCDA on Operation Teapot (1955), planned view sections.

Mr. HOLIFIELD. Will you give the year in each instance?

Mr. VORTMAN. This was in 1955.

The structure consisted of an underground room 25 feet long with utilities in one end, and entrance way, and a horizontal sliding door of reinforced concrete at the entrance.

Now, I want to point out that this structure did make use of the principle that I explained earlier of a ground level structure, such that there was no enhancement of drag or overpressure due to either diffractive or drag phenomena.

The interior of this shelter is shown in the following slide (fig. 13).

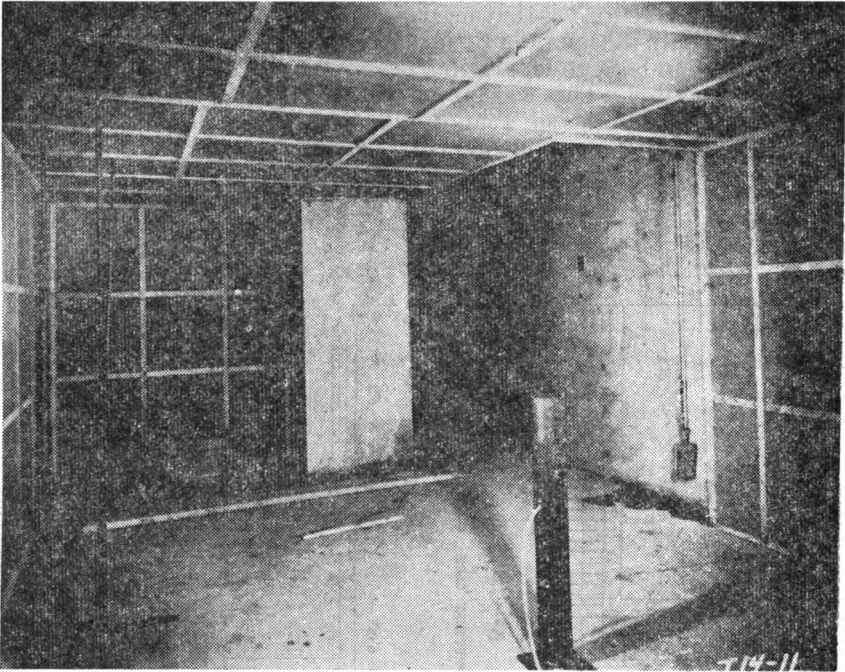


FIGURE 13.—Interior view of underground group shelter sponsored by FCDA on Operation Teapot (1955).

This view just gives you a general idea of the interior.

As tested, the shelter would accommodate 30 persons and it could be enlarged merely by increasing the length of the basic structure. The adequacy of the shelter to provide protection from neutron radiation was not firmly established.

The fast neutrons varied from 2×10^6 to 4×10^8 n/cm². That is to say, the situation varied from adequate protection to one in which 45 percent of the occupants would suffer radiation sickness. We cannot be sure that adequate protection was furnished, because there is reason to suspect the measurements.

Mr. LIPSCOMB. Is this information from 1955 as applicable today as it was in 1955?

Mr. VORTMAN. Yes. So far as blast loading is concerned, that is true.

Mr. LIPSCOMB. In other words, the tests you conducted in 1957 and 1956 have not added anything in the way of new material?

Mr. VORTMAN. No, that is not true. They have added quite a considerable amount of material. As one goes along chronologically with tests, one increases the amount of knowledge as one goes along.

Mr. LIPSCOMB. Have you done any more on this particular test? Do you have new information?

Mr. VORTMAN. Yes. I may point out that the shelters for Operation Plumbbob were included in CETG program 30.

Mr. LIPSCOMB. In this FCDA pamphlet, are they using 1955 information in that pamphlet?

Mr. VORTMAN. Someone from FCDA will have to answer that question. I assume, based on the date, that they have used 1955 information and preliminary 1957 information.

Mr. LIPSCOMB. Did you reconduct this test that you are just describing in 1957 to correct for any radiation hazards, or to obtain other necessary technical data?

Mr. VORTMAN. At this point I want to complete the statement I began earlier, that program 30 of Operation Plumbbob in the 1957 series included the shelters, and someone—the program director of program 30, I guess—will describe those later.

Mr. CORSBIE. I believe it is intended, sir, to cover that when FCDA presents its testimony.

Mr. LIPSCOMB. I just get the impression that I have heard some of this before.

Mr. VORTMAN. I am sure you have.

The shelter described above was designed to withstand 100 pounds per square inch and was successfully tested at a blast pressure just a little less than 100. When a shelter is designed for test purposes to withstand 100 pounds per square inch, it is desirable that the shelter be unscathed when subjected to 100 pounds per square inch but show signs of failure at overpressures only slightly higher.

One is seeking an optimum design for controlled yield and point of burst. If such a shelter exhibited no signs of failure at a pressure significantly greater than 100 pounds per square inch, it would be considered overdesigned, it would not be the most economical design to resist 100 pounds per square inch.

I want to point out here that one should keep in mind that a structure which fails at 100 pounds per square inch from a small-yield weapon would be expected to fail at a somewhat lower pressure from a large-yield weapon, just on the basis of a longer loading from the higher yield device. In full-scale tests of shelters, loading and response information is sought to evaluate the design procedure. The procedure, if adequate, can then be applied to the design of other shelters without the necessity of testing them. In effect, we build up a fund of knowledge which will find a multiplicity of applications.

The advantage of this approach is that it avoids the expense of continuous ad hoc testing of each individual shelter design, designed by the same procedure. But one does want to test and evaluate each one designed by a new procedure.

Now, the precision desired for testing need not be extended to shelters designed for actual use. A shelter designed to resist 100 pounds per square inch must be able to withstand that pressure and it is not only permissible, but even desirable that it withstand some additional overpressure. An optimum design cannot be attempted

outside the proving ground because only there are the yield and the burst points reasonably certain.

One can, however, adopt a minimum design pressure criteria. That is, a shelter which will not fail below a stated overpressure.

Now, the following slide, figure 14, will aid in examining this point a little further.

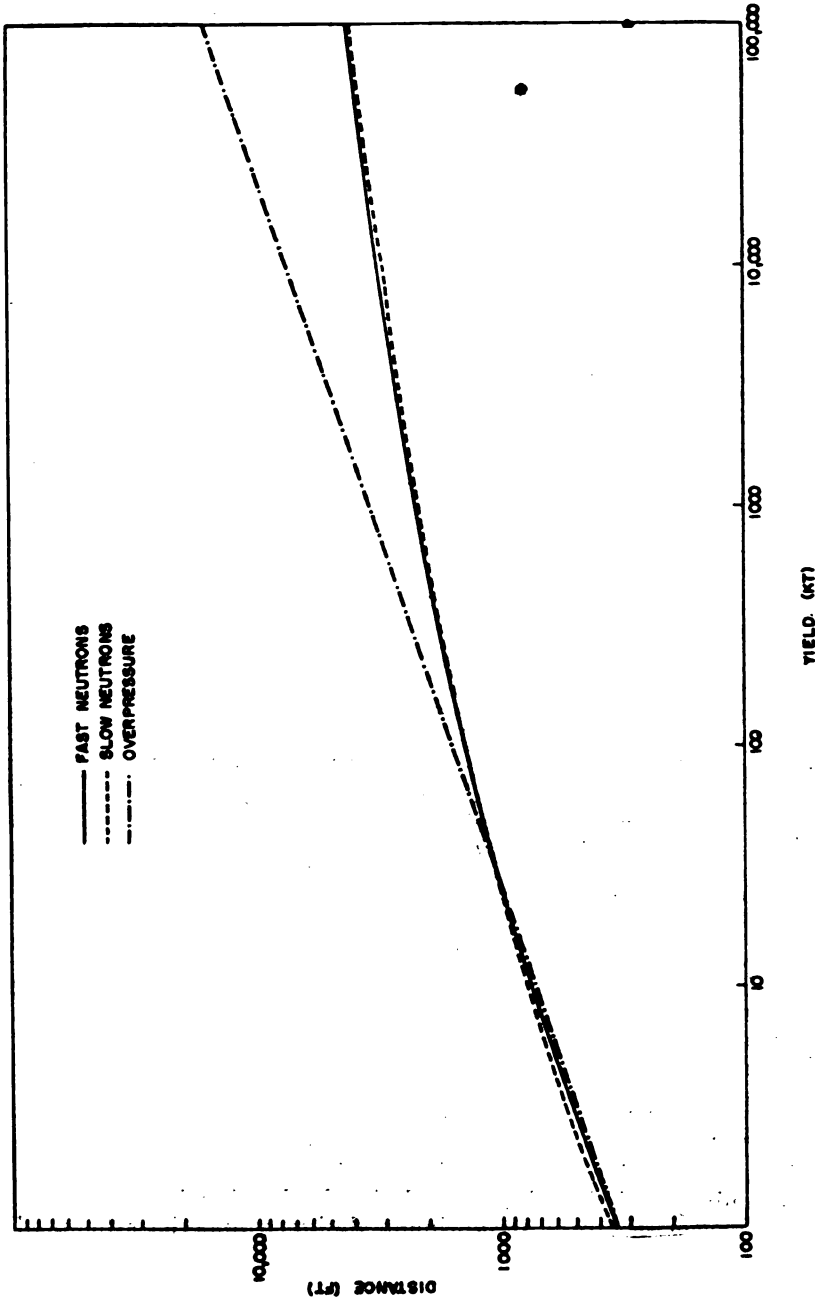


FIGURE 14.—Weapons effects radii for various yields.

This figure concerns the 30-man underground shelter we just described and shows the yield of devices on the bottom, versus the ground distance from the burst on the side. It shows the protection which would be provided from blast, and neutron radiation. Prompt gamma radiation could be included, but its curve would lie far below the other curve.

The overpressure line is the straight line and it represents 100 pounds per square inch. Again no allowance has been made for the effect of longer duration of blast waves from larger yields.

The line represents the value for which this particular shelter was designed. That is 100 pounds per square inch, a minimum pressure standard. The fact that the shelter showed no signs of failure in this vicinity indicates that its marginal pressure would be represented by a line laying somewhere below the line shown.

Now, the line below indicates survival of the structure either closer to the same yield, or at the same distance from a considerably larger yield.

Now, the point I would like to make is that even though this shelter might be considered overdesigned, which implies that maximum economy has not been achieved, the overdesign begins to lose its significance in the uncertainty as to the employment of enemy weapons, because one is never certain whether the enemy is going to drop a weapon of known yield at precisely a given distance; whether it will be the same yield at a closer distance or a larger yield at a greater distance.

The practical question becomes, then, what design can provide the most protection for a given number of dollars?

For each shelter design, a graph similar to the one shown could be prepared, together with its costs. The best shelter design for a specific location could be chosen from a group of such charts by reconciling the cost with the funds available and the degree of protection provided with the protection desired, the last being based on consideration of the proximity of the probable targets.

Before continuing, I would like to summarize certain points I have already made, as well as a few new ones.

Aboveground structures make the least desirable personnel shelters. Structures entirely below ground offer the most protection.

Full-scale structural testing of shelters should be limited to those which involve a new design concept, or procedure, and there are a number of those. For example, the corrugated metal pipe structures. That area is not well known at all.

Precise value for structural failure is not required because the significance of overdesign is lost in the uncertainties of enemy weapon employment. This point perhaps is most important, that the technical problems of neither blast loading nor structural response are obstacles to adequate shelter design at the present time and I am excluding radiation. This does not mean that we should not do continued testing.

Continued tests will give us more refined information. Information which we would like to have. But progress on shelters certainly is not being held up by a lack of information available at the present time.

It was my understanding you gentlemen are particularly interested in shelter costs. It is unrealistic to talk about costs except with reference to a particular shelter type. We may think of shelters according to the primary protection they provide as blast, or fallout shelters or according to their adaptability to family or larger groups. To place undue emphasis on any one of these attributes is like selecting one style of dress for all purposes, all climates, and all people.

Mass or group shelters are required for industrial or commercial establishments as well as for public places. Family shelters are required for smaller groups. Either should be quite close or preferably attached to or made a part of the main structure.

Blast shelters should be provided at and around likely targets, fallout shelters for rural and outlying communities. Combinations of types will obviously be required. No one type fits all needs.

In dealing with costs, the question of family versus group shelters can be sidestepped by considering cost per occupant, if one keeps in mind that the cost per person may logically be 2 or 3 times as much for a shelter accommodating only 2 people—say, a family shelter accommodating a couple—as a shelter accommodating 30 people. The cost of 1 accommodating 300 people will decrease only slightly below that of a 30-man shelter. This, however, is not valid argument against small family shelters for the smaller shelters have the advantages of greater dispersion and availability to the family.

Let us look at an example of actual shelter costs. The fact that these costs have been derived from shelters built at Nevada does not mean they should be discredited. They should only be corrected.

The 30-man group shelter discussed earlier was built to withstand 100 pounds per square inch and cost about \$1,100 per person when built at the Nevada test site. Construction costs at the Nevada test site were at that time roughly two and a half times the cost of equivalent construction in an average city.

Thus a group shelter would cost about \$440 per person if built outside NTS—the Nevada Test Site.

Two further savings could be made. The shelter could be lengthened to accommodate more people without any significant increase in the cost of entrances and the space provided for ventilating equipment and so forth.

Also, costs would be or could be reduced by the construction of large numbers of identical shelters. At a generous estimate, the cost could probably be reduced to \$300 per person, excluding land and equipment.

Mr. HOLIFIELD. Now you are referring to a specific type of shelter?

Mr. VORTMAN. I am referring in this case to the reinforced concrete 30-man shelter we saw in the drawing shown earlier.

Mr. HOLIFIELD. And that had walls and ceilings of what thickness?

Mr. VORTMAN. The ceilings were 1 foot 9 inches and the walls 1 foot 3 inches thick.

Mr. HOLIFIELD. Was that level with the ground or covered with dirt?

Mr. VORTMAN. It was covered with dirt, between 5 and 6 feet of dirt over the top of the shelter and the cover dirt was level with the ground. There was nothing aboveground. That was the shelter that had the sliding reinforced-concrete door at ground level.

Mr. LIPSCOMB. Was that just a blast shelter, or would that be for blast and radiation both?

Mr. VORTMAN. Blast, neutron radiation, and gamma radiation was measured on that particular test. It did provide adequate protection from blast and from gamma radiation. The protection from neutron radiation was a point in doubt which I mentioned earlier.

Mr. LIPSCOMB. You say that was a 30-man shelter?

Mr. VORTMAN. Yes.

Mr. LIPSCOMB. How long do you believe people should be able to live inside such a shelter?

Mr. VORTMAN. I would like to mention that point a little later if I may.

Mr. LIPSCOMB. You mentioned \$300 per person, estimated, excluding land and equipment?

Mr. VORTMAN. Excluding land and equipment.

Mr. LIPSCOMB. Have you given any estimate to the cost of the equipment for a 30-man shelter?

Mr. VORTMAN. No; that I have not. I am going on the basis of costs which were provided at the Nevada test site which did not include equipment. Obviously, there was no cost included for land.

Mr. LIPSCOMB. That was just a shell?

Mr. VORTMAN. Yes.

Mr. HOLIFIELD. Now, of what type equipment do you speak?

Mr. VORTMAN. I am speaking here, for example, of ventilating equipment. Perhaps one might want a small generator if one desired to have electric power for light or heat. Anything of that sort.

Mr. HOLIFIELD. You might even go back to candles as an emergency for a few days.

Mr. VORTMAN. That is certainly a possibility.

Mr. LIPSCOMB. But you would use up air, which is vitally needed in a shelter.

Mr. HOLIFIELD. Incidentally, before we leave that point of air, it is possible to construct hand-operated ventilating devices which will pull the air through materials which will filter out the radioactive particles, is it not?

Mr. VORTMAN. Yes; there are a number of practical solutions and I am sure those which you describe were tested during Operation Plumbbob, and will be described by someone else later.

Also, Dr. White used a rather interesting system during his animal experiments: A compressed air bottle which gradually bled air into the room.

The buried multiplate pipes which I mentioned earlier, project 34.3, the costs were about \$9,500 for each 1 of the pipes, or on the basis of 10 persons, about \$950 per person shelter.

The \$9,500 did not include a satisfactory blast-proof entrance, because these had no such entrance but were completely buried and had to be dug out later. There was a small entrance shaft part way to the surface.

Construction of such a blast-proof entrance would probably about double the cost of such shelters. Such a shelter then would cost about \$1,900 per person at Nevada, or about \$760 per person elsewhere. A lengthened shelter, mass produced, perhaps prefabricated, would probably cost about \$525 per person for about 250 pounds per square inch protection.

Again, it must be kept in mind this type shelter is not suitable for use where water tables are above 24 feet.

Now, let's examine an overall cost for the Nation of a shelter program, using these assumptions: First, about 60 million rural Americans would require fallout protection. Blast protection of varying degrees must be provided for the rest of the population. Of the remaining 110 million, approximately 45 million, or about 40 percent, are in the urban working force, and would require shelter space both at home and at work.

This gives a total of around 155 million persons for whom shelter would be built. This may seem overly generous at first, but note that I have made no allowance for shelters in places of public activity such as schools, churches, and so forth.

Now, based on the shelter costs mentioned earlier we can assume the costs as follows:

	<i>Per person</i>
Fallout only.....	\$100
25 pounds per square inch plus fallout.....	200
100 pounds per square inch plus fallout.....	300
500 pounds per square inch plus fallout.....	700

These were derived merely from the 2 points of cost I have given you earlier based on 2 shelters and if 1 makes a plot of the cost versus pressure level of protection, drawing a line through these 2 points and rounding this off to a nice even \$100 unit, the cost would be as shown above.

Now, let's look at the cost of a nationwide program based on these units costs and the assumptions that I mentioned earlier.

Shelter type	Unit cost	Total persons (millions)	Total cost (billions)
Fallout only, rural.....	\$100	60	\$22
Fallout only, urban.....	100	155	
Fallout only, rural.....	100	60	37
25 pounds per square inch, urban.....	200	155	
Fallout only, rural.....	100	60	53
100 pounds per square inch, urban.....	300	155	
Fallout only, rural.....	100	60	115
500 pounds per square inch, urban.....	700	155	

A fallout program only, the total cost would run around \$22 billion.

Fallout only for the rural people plus 25 pounds per square inch protection in the urban areas, \$37 billion.

Fallout only rural but 100 pounds per square inch protection in the urban areas, \$53 billion, and for the latter case, fallout only, 500 pounds per square inch, urban, \$115 billion.

Now, someone may want to point out that persons living in small towns are not likely to be in target areas which would require blast protection.

That is persons living in small towns would probably require only fallout protection.

Thus, if we apply this reasoning to towns of less than 25,000 people, the results are as follows:

Shelter type	Unit cost	Total persons (million)	Total cost (billions)
Fallout only, <25,000	\$100	95	\$20
Fallout only, >25,000	100	105	
Fallout only, <25,000	100	95	30
25 pounds per square inch, >25,000	200	105	
Fallout only, <25,000	100	95	41
100 pounds per square inch, >25,000	200	105	
Fallout only, <25,000	100	95	88
500 pounds per square inch, >25,000	700	105	

(Discussion off the record.)

Mr. LIPSCOMB. The figures that you have given on the charts with regard to overall cost exclude land and equipment, again?

Mr. VORTMAN. They certainly do.

Mr. HOLIFIELD. And they are based on these figures of \$300 per person and \$525 per person.

Mr. VORTMAN. That is right.

Mr. HOLIFIELD. And that is for this particular type shelter?

Mr. VORTMAN. I am assuming that it is at least reasonable to associate pressure level protection with a given cost.

Mr. HOLIFIELD. And does this take into consideration the new type shelters that were tested in 1957?

Mr. VORTMAN. It does not include any of those because I have no cost figures from 1957.

(The following additional information was subsequently received:)

Of two data points, one (\$300 per person) was from 1955; and, one (\$525 per person) was from 1957. The latter was for buried multiplate pipe which was not tested as a personnel shelter.

Mr. HOLIFIELD. I see. Well, this is important because I understand that there is a different set of cost figures for those. Different results. All right, proceed.

This refers to 1955.

Mr. VORTMAN. Yes.

Now, on the basis that we are providing only fallout protection for people in towns of 25,000 or less, the costs are reduced to 20, 30, 41 and 83 billion dollars.

Now, the estimated cost in dollars isn't the only consideration. Total new construction in the United States is approximately \$50 billion annually.

This is a measure of our current capacity to construct shelters now, if no other new construction were undertaken.

The rate of \$50 billion per year represents the most optimistic preemergency rate of construction.

If shelter construction was postponed until an emergency existed, it would have to compete for manpower and materials, with necessary emergency military construction. If only one-third of this capacity was available for personnel protection in a postemergency period—and this is based on the fact that construction volume in 1944 was about one-third of that in 1942—the time required to build shelters would be tripled, and this is probably an optimistic assumption. The time scales of such a program might look like this:

Shelter type	Cost	Preemer- gency	Postemar- gency
	<i>Billions of dollars</i>	<i>Months</i>	<i>Months</i>
Fallout only, rural.....	22	5	16
Fallout only, urban.....			
Fallout only, rural.....	37	9	27
25 pounds per square inch, urban.....			
Fallout only, rural.....	53	13	39
100 pounds per square inch, urban.....			
Fallout only, rural.....	115	28	85
500 pounds per square inch, urban.....			

Mr. HOLIFIELD. We are going to have to answer the rollcall so we will have to adjourn at this time.

The committee will convene at 10 o'clock tomorrow morning to finish your testimony and take the next witness.

Thank you, gentlemen.

(Whereupon, at 12:15 p. m., the subcommittee adjourned, to reconvene at 10 a. m., of the following day, Thursday, May 1, 1958.)

CIVIL DEFENSE

Part I—Atomic Shelter Tests

THURSDAY, MAY 1, 1958

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS,
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met in room 1501-B, House Office Building, pursuant to adjournment, at 10:05 a. m., Hon. Chet Holifield (chairman of the subcommittee), presiding.

Present: Representatives Holifield, Garmatz, Fascell, Griffith, Riehlman, and Lipscomb.

Also present: Herbert Roback, staff administrator; Carey Brewer, senior defense specialist; Paul Ridgely, and Robert McElroy, investigators.

Mr. HOLIFIELD. The subcommittee will be in order.

When we adjourned yesterday, we had before us Mr. Vortman of the Sandia Corp., who was testifying on test data regarding the physical damage on shelter structures.

You may proceed, sir, where you left off, and we will finish with your testimony.

FURTHER STATEMENT OF LUKE VORTMAN, DIRECTOR, CETG PROGRAM 34, SANDIA CORP.

Mr. VORTMAN. The table which appears on page 52 will show the time required to construct shelters if the assumptions that I made as to costs are followed.

If constructed during an emergency period, the \$22 billion program would require 5 months. If this construction were not started until after a war was begun, or until there was a national emergency, approximately 16 months would be required.

We can note the time scales required for each of the other shelter programs assumed.

Mr. HOLIFIELD. Now, this is under the assumption that you take all of the construction facilities of the United States and direct them to this one task?

Mr. VORTMAN. That is right.

Mr. HOLIFIELD. This is an unreal assumption because this would never happen, but it does give you something in the way of an evaluation of the time element, the total time element that would be involved under these two circumstances.

Mr. VORTMAN. That is correct.

If fallout shelters only were provided for urban residents in towns of less than 25,000 people, the results are those shown in the table below. The times required are somewhat less.

Shelter type	Cost	Preemer- gency	Postemer- gency
	<i>Billions of dollars</i>	<i>Months</i>	<i>Months</i>
Fallout only, less than 25,000.....	20	5	14
Fallout only, greater than 25,000.....	30	7	22
25 pounds per square inch, greater than 25,000.....			
Fallout only, less than 25,000.....	41	10	30
100 pounds per square inch, greater than 25,000.....			
Fallout only, less than 25,000.....	83	20	60
500 pounds per square inch, greater than 25,000.....			

Note that the times required are reduced but again only slightly.

It may be possible to reduce shelter costs somewhat below those cited. Existing mines could be used where they are suitably located if they have multiple entrances. Makeshift fallout shelters could be provided by using existing tunnels, large culverts, storm drains and subbasements. Percentage-wise possible economies through such measures are relatively small. However, there is one other means of significantly reducing the financial burden of a shelter program—and here the surface has hardly been scratched—that is by shifting part of the cost of shelters to other new construction through the use of dual purpose structures. For example, dual purpose underground rooms might be designed, rooms which people would want as a part of their home and which would not be regarded as something tacked on as a costly afterthought.

Dual-purpose structures, of course, inevitably result in a compromise of one or both purposes. More emphasis should be placed on obtaining designs which would be both functionally and esthetically acceptable. Much might be gained from a nationwide architectural competition.

Now, in pointing out that our information on blast loading is adequate for proceeding with the construction of shelters, I did not intend to imply additional answers should not be sought.

We should know more about the blast environment inside those existing structures which must be used as makeshift shelters and for which blast doors cannot be provided. This work can and should be done in the laboratory with shock tubes and other simulating devices and not during full-scale tests.

Second, theoretical experimental work on neutron attenuation in the usual construction materials and in various shelter configurations should be pursued.

Third, since overlapping and possibly successive fallout patterns can keep people confined to shelters for long periods of time, further attention should be given to the physiological and psychological effects of confinement.

What, if anything, can be done in the building or the finishing or supplying of a shelter to provide a better psychological and physiological environment? Are survivors better off in family-size units or in the larger group type shelters?

Many more and better dual-purpose designs are needed, designs in which the shelter is functionally integrated with the main structure in a way which is not only acceptable—that is, a minimum compromise of purposes—but also appealing.

We would like designs which would have a utility in less troubled times which we hope will exist for coming generations. We would not want designs which a peaceful world might look back on as merely monuments to the current threat of war.

Mr. Chairman, that concludes my prepared statement. I have two other pieces of information.

Mr. HOLIFIELD. Are there any questions of Mr. Vortman?

If not, before you leave the witness stand, will you give us briefly a biographical sketch of yourself?

Mr. VORTMAN. I am an architectural engineer. I have been working with Sandia Corp. since 1949 in their weapons effects Department and have participated in most of the full-scale tests including and since Operation Greenhouse.

Mr. HOLIFIELD. Thank you very much.

Now, Mr. Corsbie, who is your next witness?

Mr. CORSBIE. We would like to continue with Dr. Harris followed by Dr. White and then finish with Dr. Thompkins.

FURTHER STATEMENT OF DR. PAYNE S. HARRIS, LOS ALAMOS SCIENTIFIC LABORATORY, AND DIRECTOR, CETG PROJECT 39.7

Dr. HARRIS. I would like to give testimony on my feelings insofar as radiation considerations of protective environments are concerned.

Logically, the problem of radiation as it is concerned with design construction and occupancy of protective structures has many facets. These various items of concern are due to variations in all parameters from the source to the receiver.

I would like briefly to go over the contributing variations, pointing them out first and then going through what has been done and what should be done to improve our knowledge of these variations.

First things we should consider are variations in source. These include the type and yield of the weapon, the immediate nuclear radiations therefrom, and the conditions under which the weapon is detonated.

For this discussion we can divide weapons into two classes, or categories. These are fission weapons of low or medium yield and thermonuclear varieties.

The immediate nuclear radiations of interest are gamma rays and neutrons.

One very important thing is that the relative importance of either type of radiation varies widely from one weapon to another. This is a consequence of design and does have some importance in the shelter field. This is because the protective conditions applicable for gamma rays are almost diametrically opposite those for neutrons.

Iron, lead, and high density materials are good gamma-ray shields. For neutrons, water, concrete, and in general low density materials are good shields.

There is no direct relationship between the relative importance of these radiations and the weapon yield itself. For a sample, one

can consider Hiroshima and Nagasaki. Both of these weapons had about the same yield. In the case of Nagasaki, the neutron radiation was unimportant at all positions. In the case of Hiroshima, the neutron radiation was at least as important as the gamma-ray radiation in producing biological effect.

It has been stated often that immediate nuclear radiations from thermonuclear weapons of multimegaton yields are of no consequence. This is essentially true in the free air case. However, it may be shown that an optimum condition for nuclear radiation versus any proposed blast or thermal output can be developed at any yield.

A final condition involving the source which is important in shelter work is the detonation environment. This is concerned primarily with the height of burst.

One thing that causes us trouble in tests and one reason why we like weapons effects tests to study these items is, in doing diagnostic work there is often material accumulated in the region of the device itself which can perturb the immediate nuclear radiations to a great extent. This material would not be there in the case of actual detonation of a weapon in the case of war.

In tests for diagnostic work, it is often necessary to put various materials, locally, close to the weapon, and this may give us false readings as to the immediate nuclear radiation output.

This is one thing to remember as to why we like to have weapons effects tests that are relatively clean in the sense of no included material.

That is a little off the main problem, height of burst, but height of burst is certainly important in the construction field. Air burst systems produce local residual radiation by inducing activity in the surrounding materials. The surrounding environment, in the ground, in buildings, building materials, and this is induced by neutron output from the bomb.

Since it is generally isotropic it means that the residual radiation field is not particularly affected by meteorological conditions. It can be well estimated and assumed to be circular.

Of course, in the case of surface, or underground detonation, there is residual radiation both from induced radioactivity and from fission product fallout.

In this case, in general, the fission product activity becomes the controlling producer of dose at reasonably early times after the detonation has occurred and since it is affected by meteorological conditions, it introduces that science.

Also, either induced or residual fallout from fission products introduces questions of dose due to beta rays. This is not isolated to either residual radiation from fallout or from induced activity. In the case of fission product activity and in the cases of internal contamination that one is interested in, one has to look at gamma rays, beta rays and alpha particles. Neutrons are of no consequence in either of these conditions.

Now, the second class of variance which influenced shelter development are those involving the immediate environment of the receiver. These are, of course, basically dependent upon source characteristics which I have talked about before. The essential element of variation is the relationship of the nuclear radiations to the other two parameters of nuclear weapon effect, blast and thermal radiations.

Under any conditions of weapons design or detonation, the relative importance of these 3 affectors varies with distance from the point of detonation since none of the 3 vary in the same way with distance.

The third variant of importance in radiation considerations for shelters involves the receiver which is being protected. Here a time parameter enters. For blast and thermal radiation, the time involved in protection is briefer. For immediate nuclear radiation, the time of interest is also short.

The few seconds from the detonation to the dissipation of the flash and blast wave are all that need be considered. However, for residual radiation time it is extremely important.

The time of usefulness of the protective structure depends on the initial radiation level and rate of disappearance of the residual. Of equal importance is the response of the individual, the receiver itself, versus time of exposure. Different responses show different time relationships.

Acute responses like radiation sickness and death are inversely proportional to the rate of delivery of the dose. This means the lower the rate of delivery of the dose, the higher the total dose must be in order to cause acute responses.

Delayed responses like cancer and genetic changes are accumulative with total dose and do not depend on the delivery rate so the same dose delivered over a month, it is believed, gives the same result as a similar dose delivered over a numbers of years.

One thing that I have to support Mr. Vortman on, the adequacy of comfort in any shelter is certainly concerned with time. I am afraid if this factor has not been considered a completely adequate shelter may be negated in its efficiency because if people get bored or uncomfortable, the first thing they start to do is move around and then they come out of the shelter.

Mr. HOLIFIELD. I was in the underground shelters in England during the German blitz. There was no inclination on the part of the people to go out of those shelters while the blitz was on and they were not very comfortable shelters, I can assure you of that.

There is such a thing, you know, as the personal desire to survive which also enters into the computation of the relative discomforts that might be involved in staying in a shelter.

Dr. HARRIS. Sir, I did not mean during the time of an actual event occurring, but in events of this type there is a long-time parameter before occurrence and after occurrence.

Mr. HOLIFIELD. If the event is still occurring, notwithstanding the fact that the bombs have exploded, if the radiation still exists, it is just a different kind of event that is occurring.

Dr. HARRIS. Now, the results of experimental studies at tests up to and including Plumbbob may be broken down under this same three sets of circumstances. These are, variations in source, variations in the local environment and variations introduced in terms of the receiver itself.

The radiation information available on source variations is as complete as that on either of the other aspects of the problem.

It was pointed out as early as 1951 that source variations were induced by weapons design. There was actually no coordinated program to investigate this effect until 1955.

In 1954, members of the Oak Ridge National Laboratory, and Los Alamos Scientific Laboratory initiated a coordinated program of test work in this field. This was to measure the variation of immediate nuclear radiations from fission bombs of different design.

This program logically became a portion of the CETG effort. It has been conducted through the Plumbbob series under CETG auspices with the health division at Oak Ridge being prime participants.

Accurate information is now available on the output of neutrons and gamma rays from fission weapons of a variety of designs and yields.

The fractional portion of either radiation which comes from all directions to the receiver has been measured. This is important. I can cite you an example here that came up yesterday. In the one concrete blockhouse with the wooden door, with the door to the side, the question arose, could not the radiation inside have been due to that that came through the door.

Well, experiments just completed in the last year have indicated that generally one could say that the total amount of radiation coming through that door located on the side was only 5 percent of the total incident from all directions. So that light shields of that type, if not located in the positions that look at the heaviest directional radiation, are probably satisfactory, and this is one way to shave costs, this sort of thing, and to put this into the shelter design.

Mr. HOLIFIELD. But on the other hand, if it was on the side of direct exposure to the blast, then your incident would go up greatly from 5?

Dr. HARRIS. Yes, sir.

Mr. HOLIFIELD. And you do not know where the bomb is going to be and you have to take that into consideration.

Dr. HARRIS. Now, the directional portion of either radiation which comes from all directions has been measured.

This work was initiated primarily through an attempt to determine the exact doses of both neutrons and gamma rays to which individual Japanese were exposed in Japan. This work was not started for protective construction in this country directly. It was to determine exact doses to Japanese.

The work that is remaining in this field is to estimate these results and accumulate further data on the shielding effectiveness of Japanese homes, buildings, and so forth, that were available in Japan at the time of the detonations.

It is perfectly feasible through computation and further experimentation to extend this information to shelter design for our own population.

In contrast to fission weapon data, the immediate nuclear radiations from thermonuclear weapons are only poorly known. There are several reasons for this. These include difficulties in Pacific operations, which are inherent difficulties to that area. Also there are problems of experimental design involving large yield weapons. One finds one loses much data in the large yield case, because of inefficiencies in the actual experimental design.

Another reason has been that good neutron dose measuring systems have not been available for very many years.

If we go to considerations of variations in height of burst, these have been extensively investigated. Even before the March 1, 1954, incident studies on residual radiation had been conducted. These involved measurements of levels, energy, time decay, and decontamination. The CETG has been extensively involved in these coordinated programs. The biggest remaining problem in my mind is actually a separate science. This is the influence of meteorological conditions on the distribution of fallout material.

The predictability of what will occur if meteorological conditions are known exactly, is good. The problem of meteorological predictions has not been completely solved. I am sure you have been at Nevada and you have seen some of the throes of production that appear out there at various times prior to tests.

We talk about protective environment. It may be divided into two classes from the point of view of radiation. These are, first, those that are constructed for shelter against blast, thermal radiation and immediate nuclear radiations and, second, those that are constructed only for protection against fallout radiation.

Shelter experiments since 1951 have gradually evolved information in all categories of effect. The shielding coefficients which are an index of the amount of protection given by a shelter have been evaluated for immediate and residual gamma ray activity. The one area in which there is an extreme paucity of data is in the determination of neutron shielding coefficients for materials.

The major reason for this lack of information is a problem of neutron dose measurement in the field. Complete neutron measuring systems were first field tested in 1953 and were only put into widespread use in 1955. One can point out, however, that biological responses in small animals could have been used as a rough index of neutron effect and doses as long ago as 1951.

What little information we have in this field has to some extent assisted in reduction of fragmentary physical data.

In other words, we have developed biological systems using mice in 1950, which were put into use under field test conditions in 1951 and proved adequate as a relative measure of neutrons plus gamma rays; neutrons alone, if we had a situation with only neutrons available, or gamma rays alone, the continued biological work was minimal, essentially, until 1955.

The accumulated information available at the present time on all three variations of the protective environment field allows us to do the following: It is now possible to estimate within reasonable limits the external nuclear radiation load from neutrons and gamma rays on shelters. This can be estimated within reasonable limits for bombs of fission type of small to intermediate yields.

It can be estimated at any position with respect to point of burst and in relation to any level of pressure or total thermal energy.

Immediate radiation dose in relation to point of detonation of large thermonuclear weapons cannot be estimated with accuracy. Radiation dose produced by fallout can be estimated with good accuracy if the meteorological conditions are well known.

Air concentration of fallout material and its variations with time can also be reasonably well estimated. Shielding coefficients for shelters of a variety of designs can be estimated for gamma rays.

This involves both gamma rays produced immediately after detonation and those remaining from induced activity or fallout. Shielding coefficients are not accurately known for bomb neutron radiations. The response of individuals to nuclear radiations has been partially evaluated with respect to time delivery of radiation, amount of radiation and its energy. Thus the level of protection to be afforded by any one shelter can be established.

Construction requirements for fallout shelters could be established immediately. It is simple to get shielding coefficients for fallout as large as 1,000. This means that the radiation inside is only one-tenth of 1 percent of that outside.

We do not believe that the consequence of contamination with airborne materials is significant. Thus, costs could be decreased by the use of simple ventilation equipment. Probably the level of comfort desired for long occupancy is the limiting consideration in costs of fallout shelters.

Adequate shelters for protection against immediate nuclear radiations from fission weapons can be designed and constructed. These would not be optimum for economy of construction because of the neutron shielding coefficient problem.

Thus the shelter would have to be overdesigned for this component of radiation dose.

Optimal designs of shelters for thermonuclear multimegaton weapons cannot be designed. This is because of the lack of knowledge of the immediate radiations themselves and consequent lack of ability to evaluate the interrelationships between blasts, thermal and nuclear.

From a radiation point of view, further studies in the field are indicated. To me these basically include the measurement of shielding coefficients of structures already available in the field—that is in test areas—and new designs of structures which may be tested in the future.

Proper evaluation of immediate nuclear radiations from thermonuclear weapons I say can only be done by field measurement. Some of this work can be done by calculation, but generally one finds that nobody will accept calculations until there is an actual experiment which either verifies or denies such calculations.

As an important corollary studies should include further measurements of radiation dose as an adjunct to the continuing program to establish actual doses delivered in Japan. If it would be possible to determine the exact dose to a reasonable number of exposed persons, one could then correlate human responses directly with radiation.

If this could be done, it would be very possible that protective criteria for shelters could be relaxed or tightened as necessary. This would certainly have a great influence on a long-range shelter program.

Now, that concludes, Mr. Chairman, the formal part of my presentation.

Mr. HOLIFIELD. Are there any questions?

Mrs. GRIFFITHS. Do you think it would be sensible to provide a shelter system in the United States that provided against anything other than the worst conceivable type of assault?

Dr. HARRIS. Mrs. Griffiths, in my opinion I do not see how it would be economically feasible for the Government to provide that type of shelter system.

Mrs. GRIFFITHS. How much do you estimate it would cost?

Dr. HARRIS. Mr. Vortman has made estimates that for a minimum-type—not the worst conceivable—it would be \$22 billion.

Mrs. GRIFFITHS. We spend \$40 billion every year on arms. What do we care about \$22 billion if we are going to save a few people?

Dr. HARRIS. My general feeling along this line is that I believe in a simple system for design of fallout shelters was made available to the people in this country pointing out how these simple systems could be used for other things—this is what one might call the root-cellar concept. A root cellar makes a fine fallout shelter. A wine cellar makes a fine fallout shelter. An underground den makes a fine fallout shelter. Something simple and easy to design could be presented to the American people, pointing out the advantages of this as a shelter for fallout, pointing out what the limits would be.

I would certainly believe that the people themselves might incorporate into their own building some of these ideas which would decrease the cost enormously.

The \$22 billion, by the way, was only the shell. It did not include cost of getting land, the cost of superior materials. It is what is necessary for a shell.

If one could start with this sort of a simple system, presenting it to the American people, this would give them a chance to go ahead and do as they felt. If the idea caught hold and people did go ahead and build into their own homes, shelters, then it might be feasible, after more information is available, to go to the high level protection for vital services, but insofar as sheltering for everybody to maximum level is concerned at the present time, I personally cannot see it.

Mrs. GRIFFITHS. You mean from the expense standpoint?

Dr. HARRIS. From the expense standpoint, yes, primarily.

Mrs. GRIFFITHS. If we were attacked today, say with 20-megaton bombs, would you say that everything we have ever spent on defense would be literally worthless?

Dr. HARRIS. No, ma'am.

Mrs. GRIFFITHS. I believe the Chairman of the Joint Chiefs of Staff told me a year or so ago he would consider it worthless. Pretty close to it. Every cent of money we have ever spent would be money down the drain.

Mr. HOLIFIELD. In other words, the effect on the Nation would be so catastrophic.

Mrs. GRIFFITHS. It would be so devastating, there will be nothing left anyhow.

Dr. HARRIS. I do not believe that; 20-megaton weapons certainly are going to cause chaos, but I cannot see complete destruction due to that type of situation.

Mrs. GRIFFITHS. If we spent \$10 billion on shelters where you depended upon a wooden door and the wind being in the right direction or a certain type of weapon, and all at once the wind changed or they used a heavier weapon, wouldn't you consider the \$10 billion wasted?

Dr. HARRIS. Yes, ma'am.

Mrs. GRIFFITHS. I would, too, and I will not vote for one dime.

Dr. HARRIS. If one wishes to protect maximally, then costs skyrocket tremendously. This is for maximal protection.

Mrs. GRIFFITHS. Would you not say, really, if one wishes to protect, costs skyrocket?

Dr. HARRIS. Not if one classifies the degree of protection.

Mrs. GRIFFITHS. If you can determine the type of attack and the wind direction and a few other things, and where the bombs are going to fall, if you could just determine that, then you could build exactly.

Dr. HARRIS. Yes, ma'am, but we cannot.

For a fallout shelter itself, if that system was put into effect—first, only building fallout shelters or asking people to build them themselves, to give out simple design parameters, or assisting them in the building of such fallout shelters, there would be a percentage of those fallout shelters which would fall within the regions of high-intensity blast, thermal and nuclear radiation, which would be destroyed; but, actually, the total volume of maximal damage, or damage that would really affect shelters of this type in the case of, let us say, a 20-megaton bomb—if we did 150 of them, 150 20-megaton bombs across the country, we would encompass maximally a total of perhaps 100,000 square miles. Where these shelters were ineffective, in other words, and 100,000 square miles is a small percentage of the total land area of the United States.

Mrs. GRIFFITHS. Thank you very much.

Mr. HOLIFIELD. Could I have the slide put on the screen for a moment?

(The slide referred to follows:)

Shelter type	Unit cost	Total persons (millions)	Total cost (billions)
Fallout only, rural.....	\$100	60	\$22
Fallout only, urban.....	100	155	
Fallout only, rural.....	100	60	37
25 pounds per square inch, urban.....	200	155	
Fallout only, rural.....	100	60	53
100 pounds per square inch, urban.....	300	155	
Fallout only, rural.....	100	60	115
500 pounds per square inch, urban.....	700	155	

Mr. HOLIFIELD. Could I have a figure on what the pounds per square inch urban figure means, in the second section which deals with 37 billion?

Mr. VORTMAN. Twenty-five pounds per square inch would be something around 500 feet from a 1-kiloton or a mile from 1 megaton.

Mr. HOLIFIELD. A mile from a megaton. In other words, if you were a mile from zero point of a megaton bomb, it would give you fallout protection for both rural and urban and it would give you protection from blast pressure and fire, theoretically within the 25 pounds per square inch limit, is that right?

Mr. VORTMAN. Beyond the distance. For anything beyond the 1 mile. It would not protect the people within the 1 mile.

Mr. HOLIFIELD. We do not know where the bombs will fall and we cannot anticipate that they will all fall in the maximum destruction center—in the target center of the maximum destruction potential.

We could assume that, if we would give that type of shelter, that you could probably protect 80 percent of the people in the United

States from both the blast and the fire and the immediate fallout. Is that not true?

Mr. VORTMAN. It would be difficult to estimate the exact figure because if one assumed something of the order of 150 bombs, one probably would assume that these would be detonated at or near the highest concentrations of population, so even though this represented a relatively small land area, it might represent a rather large percentage of the population.

Mr. HOLIFIELD. Providing they hit in the center of that population mass.

Mr. VORTMAN. That is right.

Mr. HOLIFIELD. Your next bracket there of 100 pounds per square inch pressure would give much greater protection, would it not, if you had structures of that type?

Mr. VORTMAN. That would give protection to people perhaps out beyond a half mile from 1 megaton.

Mr. HOLIFIELD. In war, you do not contemplate complete protection of all your troops. You contemplate a system that will give you maximum protection commensurate with your military mission, and in the case of an attack upon the Nation, it would be better to have any one of those estimates there, starting in with your \$22 billion and your \$37 billion and your \$53 billion, rather than not to have any protection at all, because you could not give maximum protection to everyone. Is that not true in terms of saving human life?

Mr. VORTMAN. That statement is certainly true. With each one of these you would be saving an increasingly larger percentage of the population.

Mr. HOLIFIELD. Now, assuming we even wanted to go to the \$53 billion figure, or the \$115 billion figure, the comparison of that expenditure in relation to the accumulative expenditure for defense since World War II in the past 12 years would be very, very small, would it not?

Mr. VORTMAN. Perhaps this is true.

Mr. HOLIFIELD. Roughly, we have spent close to \$500 billion since World War II in defense installations—\$500 billion. So, even if you took the \$115 billion figure and spread it out over a term of years as you have your defense expenditures, you would be only increasing your defense expenditures about 20 percent.

Mr. VORTMAN. This is certainly true but I would like to emphasize again that there is, also, the problem of time required in terms of materials and construction manpower available.

Mr. HOLIFIELD. That is why I said you spread it out over the years.

We even spread our defense expenditures—each year we spread it over a period of time as high as 4 or 5 years in the case of carriers, bombers and new military devices. Probably our expenditure on missiles will be spread out over a period of several years. So we are not talking about a program that has to be done the next Saturday night. We are talking about a program of preparation for the Nation and it would necessarily envisage the same period of time in which it could be fitted into the economy, both expensewise and construction timewise.

Mr. LIPSCOMB. Mr. Chairman, inasmuch as we are using those total cost estimates, I wonder whether we could have the formula on which those are based.

Mr. HOLIFIELD. Do you have additional backup material on that which you have not presented to the committee? Undoubtedly you must base its unit cost of the actual shelters tested. Do you have any further backup material to give us?

Mr. VORTMAN. Only to explain how this was done, and certainly it was quite crude.

Mr. HOLIFIELD. Let me stop you there. All the information we have been given is on the 1955 shelters?

Mr. VORTMAN. No.

Mr. HOLIFIELD. Why have we not been given any information on the 1957 shelters?

Mr. VORTMAN. I did present one data point on 1957.

Mr. HOLIFIELD. We called this hearing to find out what happened in Nevada on a series of some 20 shelters out there and we hoped that we would get some specific information.

Do you intend, Mr. Corsbie, to bring us up to date on the actual statistics of those specific shelter tests in Nevada last fall? And, if so, who is going to present it?

Mr. CORSBIE. Dr. White will cover the biomedical aspects of blasts on the shelters in which he participated and Dr. Tompkins will talk about the results of the radiological shelter. The shelters under other programs will be covered by Federal Civil Defense witnesses.

Mr. HOLIFIELD. The point at issue here is, why should we concern ourselves with this type of statistics on the 1955 tests if we are going to have different figures given us and different test materials given us on the 1957 tests?

We are more interested in current history than we are in past history.

Mr. VORTMAN. I can shed a little light on that.

First, there should, within the assumptions made for this particular chart, be little difference between costs, 1955 and 1957.

My costs here were based on one 1955 data point, one 1957 data point. If one assumes that there is a logarithmic relationship between the overpressure and the cost and if one assumes that this is not a precise relationship but a very broad relationship which could be drafted with a very wide line, the costs shown here will agree with the costs of those two data points.

Mr. HOLIFIELD. Will you present, then, an explanatory statement on that point for the record I mean later?

Mr. VORTMAN. We will be very happy to.

Mr. LIPSCOMB. Does this mean he will give us a formula for how the costs on this 1955 chart are arrived at?

Mr. HOLIFIELD. I would hope it would be.

Mr. VORTMAN. Yes.

Mr. HOLIFIELD. These are based on actual structures?

Mr. VORTMAN. These are based on two actual structures one 1957 and one 1955.

Mr. HOLIFIELD. What type of structure in 1957?

Mr. VORTMAN. In 1957 I was using the cost of the 7-foot diameter multiplate pipe, with 10 feet of cover that I described earlier.

Mr. HOLIFIELD. Do you mean you folks do not have ready for us, or FCDA does not have ready for us any statistics on the costs of the different types of shelters out in Nevada that you used last fall, nor do they have any measurements on blast and radiation recorded in those shelters?

Mr. VORTMAN. Perhaps the people representing program 30, CETG, will have those figures. The shelters were included in program 30, on the 1957 tests. Mr. Corsbie can perhaps answer that.

Mr. CORSBIE. Mr. Chairman, the total costs of all of the shelters are a matter of record and could be provided to you. I am not familiar with just how much detail or how the Federal Civil Defense will present the costs. We have it, of course, that is, the total costs to do the building in Nevada, the construction.

(The information requested follows:)

MAY 12, 1958.

HON. CHET HOLIFIELD,

Chairman, Military Operations Subcommittee, Committee on Government Operations, House Office Building, Washington, D. C.

DEAR CONGRESSMAN HOLIFIELD: Pursuant to Mr. Lipscomb's request for the formula used to obtain the cost estimates presented to the committee on April 30, 1958, I am furnishing the following information.

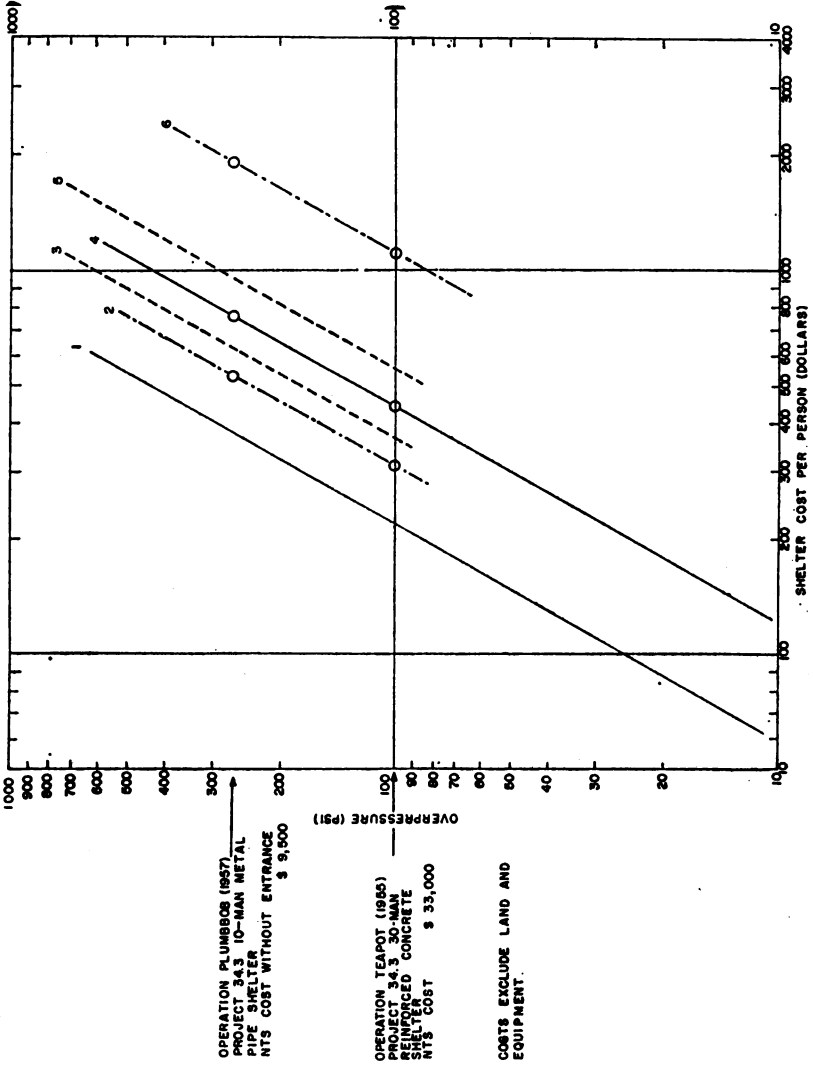
No mathematical formula as such was used, nor was it intended that the preciseness of a formula apply. The attached graph showing overpressure versus cost per person, excluding land and equipment, will assist in understanding the procedure used. Two data points were used, both from program 34 construction, the cost of which were readily available: One from a 1955 test shelter at 100 pounds per square inch costing \$1,100 per person at the Nevada test site, and one from a 1957 test shelter at 265 pounds per square inch costing \$1,900 per person after adding the estimated cost of entrance and escape hatch (line 6 on the graph). These costs were reduced by $2\frac{1}{2}$ to account for the added cost of Nevada test site construction (line 4). Any reduction between 2 and 3 would be reasonable and the spread thus created has been shown between lines 3 and 5. The costs represented by lines 3 and 5 can be further reduced by between 20 and 40 percent through the use of mass production economies and by lengthening the shelter. The spread in this unit is represented by the spread between lines 1 and 4. Line 2 is an approximate average. Costs I quoted April 30 are near the average values rounded off to the nearest \$100. Note that the \$100-per-person cost quoted by Dr. Paul Tompkins on May 1, 1958, for a 16-pound-per-square-inch shelter falls within the spread.

We are all acquainted with the wide spread which frequently occurs between bids submitted by contractors bidding on the same job, say a house with 2,000 square feet floor area. The spread is even wider if one generalizes and examines the spread between all bids on all house designs having floor areas of 2,000 square feet. In this case too, we are generalizing—not looking at specific designs.

The important point is not the preciseness of the figures quoted April 30 but is this: Any cost which lies within the spread represented by lines 1 and 4 should be considered reasonable and valid. Any estimated cost which falls to the right of line 4 is probably too high, and any estimated cost which falls to the left of line 1 should be critically examined with a degree of skepticism proportional to the distance the estimate lies to the left of the line.

Very truly yours,

LUKE J. VORTMAN,
Director, CETG Program 34.



Mr. HOLIFIELD. Those costs in Nevada can be used only as a comparison with the nationwide costs. They would not give you the nationwide costs of that type shelter?

Mr. CORSBIE. Sir, I am quite skeptical as to the value of using the costs of constructing shelters in Nevada if the figures are to be applied to a nationwide system, for the simple reason that due to delays, uncertainties, long workweeks, premium pay and other influences, even the costs from one year to another year might not reflect the same situation.

Mr. LIPSCOMB. Don't you have the same problem up here on this chart?

Mr. CORSBIE. I think there are uncertainties in the slides. Certainly, yesterday Mr. Vortman said clearly that he assumed that the costs at Nevada were, as I remember, about two and one-half times what they would be as a national average.

Mr. HOLIFIELD. This \$22 billion, is this an average of what it would cost nationally or an extrapolation of the Nevada tests?

Mr. VORTMAN. This is based on the Nevada costs divided by 2½.

Mr. HOLIFIELD. Mr. Gallagher, are you intending to give this type of information?

Mr. GALLAGHER. We intend to give a quite full explanation of the 1957 tests.

Mr. HOLIFIELD. If there are no further questions on this point—will you please, Dr. Harris, before we conclude with you, give us your background of experience and qualifications?

Dr. HARRIS. Yes, sir. I was a physicist before the war. I am an M. D. now. I have been at Los Alamos essentially since 1949.

I participated in various capacities in tests since 1951 and including 1951 and at the present time I am an alternate group leader in biomedical research and I am a consultant to several national agencies.

Mrs. GRIFFITHS. Dr. Harris, do I understand from your testimony that you have rendered your conclusions based on maximum protection?

Dr. HARRIS. No. Speaking only from the radiation point of view, we do not have enough information to give maximum protection at minimum cost. You would have to overdesign to take care of uncertainties in the information which would increase the per-dollar cost several percent for every percent increase in design efficiency.

Mrs. GRIFFITHS. Will you define for the record what you mean by maximum protection?

Dr. HARRIS. Maximum protection is, again from the point of view of radiation as I define it—

Mr. FASCELL. Do you mean by that you are going to limit your definition to radiation only?

Dr. HARRIS. Yes, sir.

Mr. FASCELL. In other words, all of your remarks, then, would be limited to this definition?

Dr. HARRIS. Yes, sir, I speak only of radiation.

Maximum protection against radiation would be a system such that the total dose received by any individual in this country would be of such a level as to agree with the maximum permissible levels now allowed people working in the field.

Generally, one speaks of maximum permissible levels for large groups as one-tenth of those for people working in the atomic energy field. I am saying for my concept of maximum protection, the value in this case would be equal to that used for operations—people working in the atomic energy field.

Mr. FASCELL. In this concept of maximum protection for radiation, you are excluding therefrom all thermal problems and blast problems?

Dr. HARRIS. Yes, I am.

Mr. LIPSCOMB. Doctor, when you began your testimony, you qualified it by saying that these are "my feelings." Was your testimony a consensus of scientific opinion at the naval laboratory, or was it your own opinion?

Dr. HARRIS. I am not at the naval laboratory, Mr. Lipscomb. I am at Los Alamos.

Mr. LIPSCOMB. You said you were the chief of some group?

Dr. HARRIS. I am the alternate group leader of the Biomedical Research Group at Los Alamos.

Mr. LIPSCOMB. I will just state my question again.

You qualified your testimony by saying "My feelings." I wondered whether your testimony was a consensus of the scientific opinion at Los Alamos.

Dr. HARRIS. My testimony is not a consensus of the scientific opinion at Los Alamos. Within the group that I am in, the views I have expressed here are in line with our group thinking. The majority of the people at Los Alamos are not involved in this at all and therefore do not have opinions on this particular problem.

Mr. HOLIFIELD. Your testimony is representative of the majority thinking of the group in your Biomedical Division?

Dr. HARRIS. Yes, sir.

Mr. HOLIFIELD. And it is not in contradiction to the majority opinion?

Dr. HARRIS. That is right, sir.

Mr. FASCELL. Mr. Chairman, this raises another question, if I may ask it.

Mr. HOLIFIELD. Proceed.

Mr. FASCELL. Your position is that we do not know enough about radiation protection or effect to intelligently provide shelters?

Dr. HARRIS. If one speaks of all types of shelters, this is true. If one restricts oneself to shelters for fallout protection only, the feeling is that we can adequately protect, if one stays only within the realm of fallout shelters.

Mr. HOLIFIELD. In other words, you know enough about the radiation, about the effect of radiation upon human organisms that you can prescribe a limit of protection which is needed and you know enough about engineering and architecture and building materials to provide that element of safety and protection?

Dr. HARRIS. For fallout shelters. For immediate nuclear radiation shelters, in which we do not even know some of the immediate nuclear data that comes out, we do not have either enough physical or biological data to guarantee maximum protection.

Mr. HOLIFIELD. That is true, and when you speak of maximum protection, you speak of 300 milliroentgens allowed over a certain length of time, or whatever the maximum permissible dose is that is set up

by the National Academy of Sciences and the Atomic Energy Commission for general population exposure?

Dr. HARRIS. No, sir, for work, in the atomic energy field.

Mr. HOLIFIELD. For workers in the atomic energy field, and you do not speak of tolerable doses which a person might get and still survive?

Dr. HARRIS. No, sir.

Mr. HOLIFIELD. So, when you speak of maximum, you are speaking, you might say, of perfection, of a perfect system, or a near perfect system in the place of something in this fallible world that would be of value?

Dr. HARRIS. Yes, sir

Now, if you wish me to qualify it, not what I would call maximum protection—

Mr. HOLIFIELD. You are talking of thousandths of roentgens and you are not talking about roentgens of exposure which the human body could withstand and survive and even survive without a great deal of deleterious effects?

Dr. HARRIS. Yes, sir. If I talk in that way, there is enough information available in all categories to give that level of protection. There is enough information from the point of view of radiation to give protection, certainly at levels of 100 roentgens.

Mr. HOLIFIELD. Around 400 roentgens is usually considered to be a lethal dose, and when we speak of thousandths of a roentgen you are speaking of less exposure than you would get in a fluoroscope?

Dr. HARRIS. Yes, sir.

Mr. HOLIFIELD. So we must consider your testimony in the light of—

Dr. HARRIS. Level of protection.

Mr. HOLIFIELD. Level of protection in which you are speaking and not in the level of protecting the people from the reasonable amount of radiation that might come from fallout outside of the immediate local fallout of zero point bomb detonations.

Dr. HARRIS. I think we have enough information to go to maximal protection for fallout radiation within this category of maximum protection. If we relax to an intermediate protection category, I think we have information to give not only shelter from fallout, but also shelter from near-burst conditions which are in the area of point of burst and all these other factors that enter into it.

Mr. FASCELL. If you arrived at that point, what protection would you have—what level of protection would you have, if any, with respect to the immediate radiological effects?

Dr. HARRIS. Insofar as immediate radiation effects are concerned, if one takes this level of something nominal like 100 rad of total dose, we have enough information to be able to protect against that level, even though our information is scattered in certain categories.

This is because—this means we can accept wider areas in our estimates because we have not become so restrictive.

When one talks about levels of radiation of 100 rad, 200 rad, 300 rad, 400, a thousand, in actual distance covered, in area, in systems of this sort, the actual distance covered can be measured in terms of a few hundred yards.

The CEP's of the men dropping the bombs themselves are larger—the circular errors of probability in those cases are larger than the range from zero acute death to 100 percent acute death. If one allows one's sights to go up to guarantee protection only to the level of 100 rad or attempt to guarantee it, one is within the circular probability error of the bomber and even though our information is fragmentary, it is still less than this circular error probability.

Mr. HOLIFIELD. This is why I brought out the thought a minute ago that in warfare you do not demand perfect defense for every military operation. We are faced with the new practical assumption that there will inevitably be a certain amount of casualties and because we cannot protect 100 percent does not necessarily mean that a general in charge of troops should not obtain the maximum protection for the greatest number in any given military operation. The same obligation in my opinion, rests upon those who are responsible to give the people of the United States the maximum amount of protection possible within the range of scientific knowledge and within the range of economic possibility, and not to hesitate on the grounds that we can not give a technical maximum protection, either from blast, fire, or radiation.

Dr. HARRIS. Yes.

Mr. ROBACK. Mr. Chairman, may I ask one question? The distinction was made between fallout and immediate radiation effects.

Now, is the problem of immediate radiation effects a part of the problem of protecting against weapon effects in the explosion area for given distances? So there is not a special problem, is that the case?

Dr. HARRIS. Yes.

Mr. ROBACK. So there is not a special problem of immediate radiation protection. It is a question of fallout protection versus radiation and other effects protection?

Dr. HARRIS. Yes; and the reason why this uncertainty comes in is because blast and thermal radiation do not follow each other exactly in distance. If they did, information on overpressure would be all that would be needed and we have better information in overpressures than we do certain categories of radiation.

Mr. HOLIFIELD. The committee will stand adjourned to answer the rollcall.

(A brief recess was taken.)

Mr. HOLIFIELD. The committee will be in order.

I believe Dr. Clayton White is the next witness.

Mr. CORSBIE. Mr. Chairman, with your permission we would like to make a change in our order and have Dr. Tompkins testify. This is to accommodate Dr. Tompkins.

Mr. HOLIFIELD. We have a little problem with one of the witnesses from the FCDA who has to be back in Connecticut and then if we put Dr. Tompkins on now we will ask Dr. White to step aside for the time being so we can accommodate Dr. Newmark who has to catch a plane back.

Would you like to have Dr. Tompkins on now?

Mr. CORSBIE. If you please, sir.

FURTHER STATEMENT OF DR. PAUL C. TOMPKINS, SCIENTIFIC DIRECTOR, UNITED STATES NAVAL RADIOLOGICAL DEFENSE LABORATORY, AND DIRECTOR, CETG PROJECT 32

Dr. TOMPKINS. Mr. Chairman and members of the subcommittee, I will be reporting on CETG project 32.3.

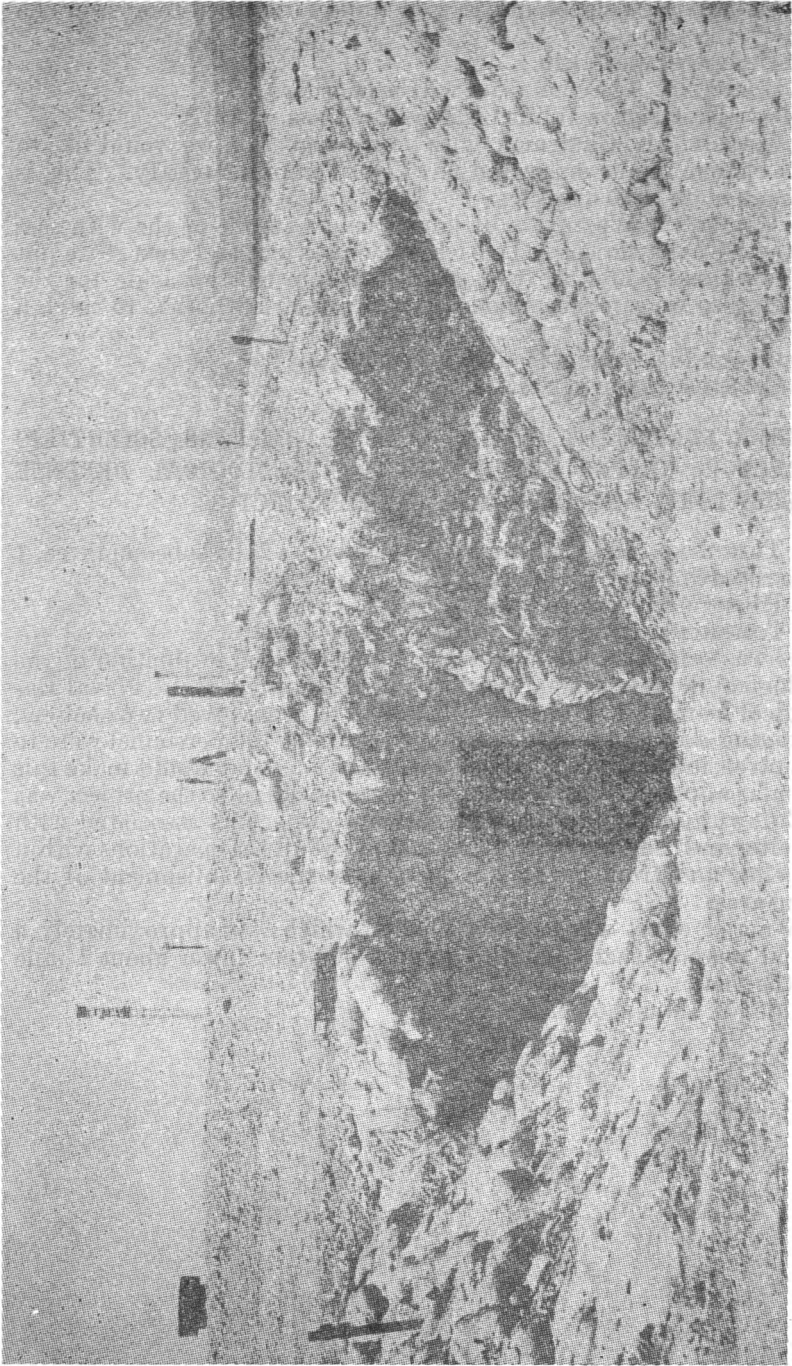
Mr. HOLIFIELD. For what year, please?

Dr. TOMPKINS. 1957.

This was originally planned to be an operational evaluation of the radiological defense system proposed by the United States Naval Radiological Defense Laboratory. It was to have involved two shelters, one staging area and a small vital area. About 100 personnel were to be involved in the project. The shot conditions that would make this particular approach worth while did not materialize so the project was scaled down to a study of certain system components associated with the shelter and the staging area, and a study of all the operations within the shelter and from the shelter leading to the establishment of the staging area.

Our major effort was on Shot Diablo, which was approximately a nominal weapon, that is 20-kiloton on a 500-foot tower about 1 mile from the shelter.

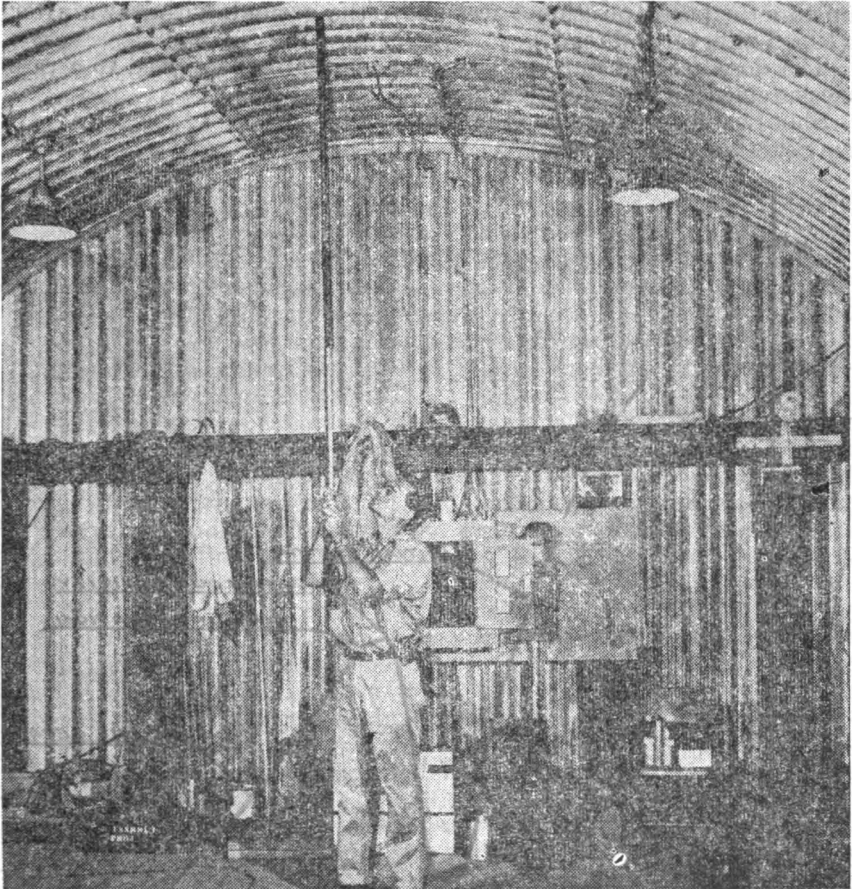
(Slide No. 1 was shown.)



Slide No. 1.—Entrance ramp, showing tunnel opening

The first slide shows the entrance tunnel to the shelter with the Diablo tower in the background.

(Slide No. 2 was shown.)



SLIDE No. 2.—Interior of the shelter near the door.

The second slide shows the interior of the shelter near the door.

Mr. HOLIFIELD. Is this after the shot?

Dr. TOMPKINS. No, these are pictures before the shot. The shelter is a modified Navy stock ammunition storage magazine, 25 feet by 48 feet. The modification consists of the wooden strongback shown there on the end wall.

An identical structure was tested for blast resistance in another program and another shot and performed very well.

Our concern was with the radiological protection afforded by the shelter when it contained such operational necessities as ventilators, fast-loading entrances and similar openings.

Mr. HOLIFIELD. Now, will you tell us something about the earth coverage on this?

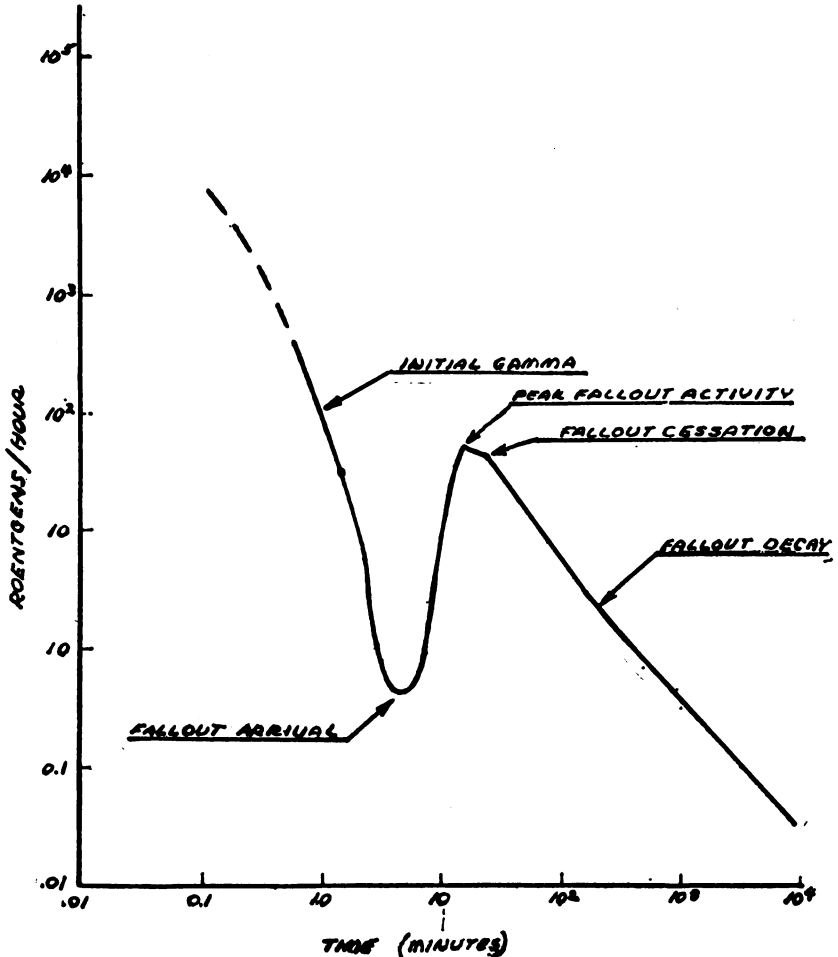
Dr. TOMPKINS. Yes, sir.

What you see on this slide is the forward dosimeter tube which is the basic operational radiation detector in the shelter. It consists of a 1-inch steel pipe fitted with a rod that carries the self-reading dosimeter at the upper end. In use, the dosimeter is read, pushed up to an exposed position 3 feet above the ground, withdrawn after a timed interval and read.

The dose accrued during the timed interval is converted to a rate measurement in roentgens per hour.

Shot Diablo gave us a good fallout.

(Slide No. 3 was shown.)



SLIDE No. 3.—Time sequence of the arrival of the fallout.

The next slide shows the time sequence of the arrival of the fallout at the shelter. The left-hand side up there shows the initial gamma. That dropped off at the middle period until the fallout arrived and built up to a peak and dropped off with normal radioactive decay.

Mr. HOLIFIELD. What are the numbers on the bottom?

Dr. TOMPKINS. That is time in minutes. It shows that the peak fallout arrived about 15 minutes after shot time.

Mr. HOLIFIELD. What is the reading on the left?

Dr. TOMPKINS. The reading on the left is in roentgens per hour. The peak was about 100 roentgens per hour which is a dose, a total dose outside of the shelter approximately equal to that which the Rongelap group received after Castle Bravo. This is the reading on the outside.

The group of Rongelap received about 150 to 175 roentgens total dose.

Mr. HOLIFIELD. What has been the history of those people? Have we enough knowledge to predict the physical effect upon them? I saw some of these people personally and interviewed them, and I saw some of the burns which they had and hair slippage and one thing or another, which was minor in degree.

Can you tell how long it took them to restore the blood count to normal and whether there have been any long-range deleterious effects that the doctors can testify to?

Dr. TOMPKINS. I could comment on that, Mr. Chairman, briefly. There certainly were no fatalities. All of the symptoms were cured. I believe that the time for recovery of the normal blood count was something of the order of 3 months and at the present time there are no further indications of injury, or incapacitation. It is too early to tell about the very long, delayed effects. Apparently they are all right at this point.

Mr. HOLIFIELD. I think it is important to understand that even though you are exposed to a considerable number of roentgens, it does not necessarily mean that death will result. There might be a possible shortening of the days or weeks or years of a person's life as a result of that. There might be a general susceptibility to disease which might take them off, but certainly when we speak of shelter which does not shelter completely but does keep the exposure to a tolerable amount in terms of continuity of life, as contradistinct from outside exposure which would mean death within a few days or weeks, why we are in a field where there is a great area of protection that can be offered if we go about it in the right way, is that not true?

Dr. TOMPKINS. I think that is correct; yes.

One might point out that the doses received could not have been much larger without creating casualties. They are certainly on the upper margin of coming out all right.

I would like to pause here in my formal statement and describe briefly for you the actual shelter. The shelter is one of the hemispherical quonset-type huts completely buried in the ground. The shelter entrance was the first slide.

It is completely buried.

Mr. HOLIFIELD. The size of this was 25 by 48?

Dr. TOMPKINS. 25 by 48.

Mr. HOLIFIELD. And it had how much earth over it?

Dr. TOMPKINS. Three feet. It is basically the same as the one Mr. Vortman has talked about. The important thing is to see how much of a lump was raised there. The shelter itself was at ground level. A hole was dug in the top of the shelter at ground level and the earth piled back over it.

The entrance which you see there runs directly into the side of the shelter which was done primarily because of the speed with which we had to get the thing in the ground and also we wanted to find out just how significant the necessity for a 90° bend would be. If I may now return to the statement.

I think the significant thing is that the shielding from the earth cover, which was about 3 feet at the crown of the shelter was very good. Namely, there was a reduction in radiation intensity of the order of 10,000.

Mr. HOLIFIELD. Now for the record, give us what it was outside again and what it was inside.

Dr. TOMPKINS. It was about 100—when it was 100 roentgens per hour outside, it was 10 milliroentgens per hour inside.

Mr. HOLIFIELD. In other words, if a person had been caught without shelter on the outside and had been subjected to 4 hours of exposure to outside environmental radiation of that intensity, it would undoubtedly have been lethal.

Dr. TOMPKINS. If the intensity maintained itself at that current rate.

To be more exact, if the total dose outside were 10,000 roentgens the total dose to personnel inside would have been 1 roentgen.

Mr. HOLIFIELD. Let's take it on the terms of lethal dose. If a lethal dose outside would be considered to be 400 roentgens, how much would you have had on the inside, four-tenths of a roentgen?

Dr. TOMPKINS. About four-hundredths of a roentgen.

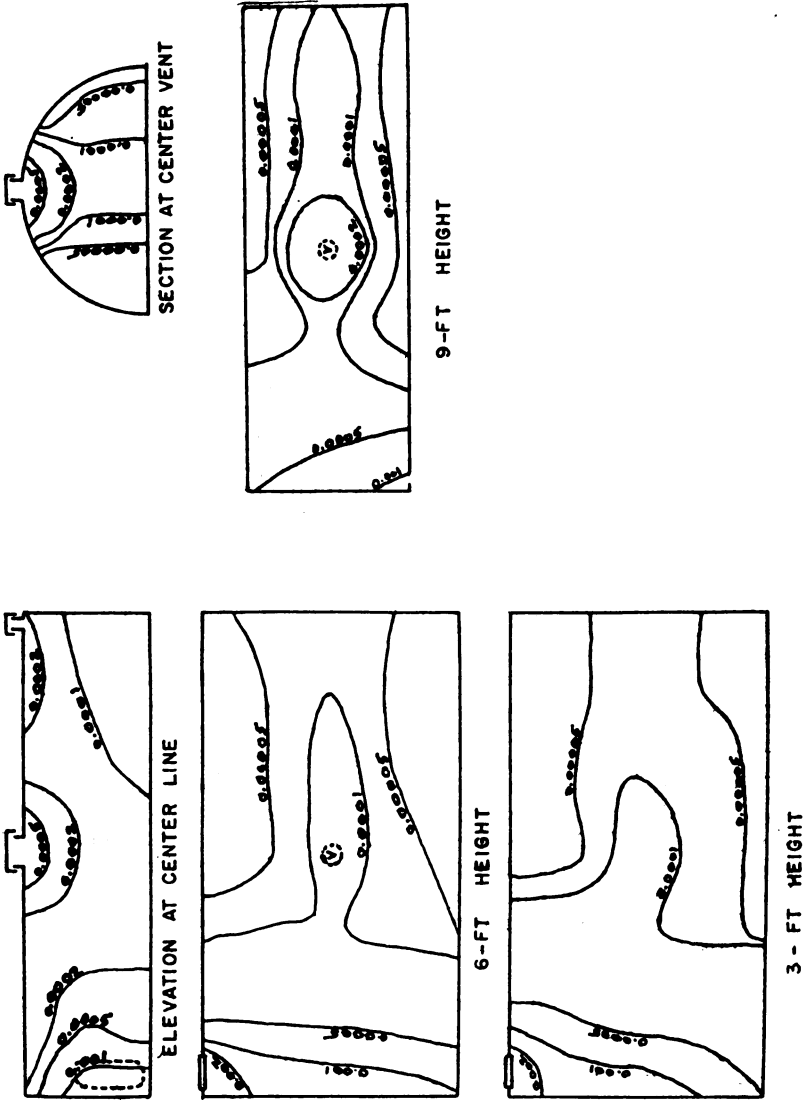
In other words, the protection level provided here was exceedingly good. The requirement we were shooting for was about 1,000 to 5,000. What we got was something of the order of 10,000 and better.

Mr. LIPSCOMB. Does the ratio go in that proportion, 10,000 outside to 1 inside?

Dr. TOMPKINS. Yes; either in dose rate or accumulated dosage, the ratio will still stay the same.

If I may have the fourth slide, I would like to point out some of the significant things.

(Slide No. 4 was shown.)



SLIDE No. 4.—Residual number contours for first interior survey, Shot Diablo.

We have here a plot of the actual reductions at different levels and different plans within the full volume of the interior of the shelter. If you will look at the top line where you see the elevation at the centerline, there is an opening. That is the ventilator opening. Then you will notice that even at a distance shortly below that, the radiation ratio is on the order of 0.0005, and that was one of the major findings—such openings are one of the weak links in fallout shelters, and that gives a measure of the amount of actual scatter from the deposit which was at that point sitting on top of the shelter.

If you will look at the center slide, it shows the distribution at a height of 6 feet and the bottom is one of a height of 3 feet. Now you will notice that curve at the middle which is 0.001. That is one to a thousandth reduction which was our design criteria. You will find that that bulges in one direction. That direction is in the direction of the door. If you will look on the far corner over there, you will note that the—excuse me. I had it backward. The door is in the upper lefthand corner. You can see it marked. There the reduction was 0.002 and the weakest shielding in the shelter. This can be readily corrected by a 90° bend which will drop out the scatter.

The reduction was measured over in one far corner and we got as much as a reduction of 1 to 100,000. You will notice it is characteristic that the protection inside of the shelter is not uniform throughout the entire volume of the shelter. The purpose of this project is to be sure that the weak points did not really defeat the purpose of the shield.

This is the simplest of the fallout design shelters. Among other things, we wished to test the ventilation configuration in the hope we could eliminate any requirement for filtration of the intake air. The results we got on this phase of the experiment were not conclusive because we did pick up a little activity on our filter and we are still evaluating the data. It does not appear that enough material—we can't prove unequivocally that enough material did not enter to have defeated the shielding somewhat, so our data on that particular point is a little weak but the amounts were exceedingly low.

In general, we feel we know a great deal more about the design of an operating shelter than we did before and the details of this project are published in ITR-1464, a copy of this has been provided for the record as the bulk of the direct technical testimony of the results of project 32.3, Operation Plumbbob.

Mr. HOLIFIELD. This structure being 25 by 48 would give you about 1,200 square feet of floor space.

Dr. TOMPKINS. Yes.

Mr. HOLIFIELD. And in an emergency shelter what could you figure to the person, 10 feet to the person?

Dr. TOMPKINS. We feel this shelter can be designed to accommodate 100 persons. This is the standard so-called 100-person shelter.

Mr. HOLIFIELD. What would the cost be for this type of structure, not in Nevada, but throughout the United States?

Dr. TOMPKINS. We feel this particular shelter, which is quite a simple one, but very effective, should be able to be put in the ground and equipped with such things as necessary bunks, clothing, emergency rations, and so forth, for approximately \$100 per person. This corresponds very closely with the \$22 billion fallout shelter program

which Mr. Vortman talked about and also corresponds very closely to the estimate that we gave in our previous testimony.

Mr. HOLIFIELD. How many pounds per square inch pressure was this subjected to?

Dr. TOMPKINS. This was actually subjected to 4 pounds per square inch.

We feel it would probably have taken up to about 10.

Mr. ROBACK. Dr. Tompkins has not mentioned it in his statement, but members of the Naval Radiological Defense Laboratory were in the shelter during the explosion. Some of us had an opportunity to inspect that shelter afterward. Can you tell us something about the reactions of the people who were in there?

Dr. TOMPKINS. Yes, sir. The shelter was occupied, which was a part of the plan.

Mr. HOLIFIELD. How far was it from ground zero and the size of the shot was around 20 kilotons?

Dr. TOMPKINS. It was 20 kilotons. This particular one was set at 1 mile. We had to apply some rather stringent safety requirements for the test organization. Nevertheless, I think it is significant that the overpressure and radiation levels which we observed at this shelter were approximately equivalent to the positions at which 35 to 40 percent of the people were killed at Nagasaki and Hiroshima.

As far as our reactions were concerned at the time of the blast, a little dust kicked down through the ventilator system. The noise of the blast itself was roughly, as Mr. Strobe put it, like a garbageman dropping a lid on a can in the morning, and that was about the extent of it.

Our operational plan called for us to measure the intensity outside to determine when we could come out and, using the scraping equipment, clear off a clean area.

We think this particular project demonstrated that the people in this shelter could have been functionally back in business on top of the ground in 3 days or less.

Furthermore, despite the dose rates encountered, the actual dosage to the personnel involved in this never exceeded or never even came up to the limits established by the test organization for permissible exposure.

I think it is significant that the demonstration of the ease with which a situation which in one case was responsible for the death of thousands of people was ridden through so smoothly and easily under these circumstances. We do have, Mr. Chairman, a film, a movie of the events in the shelter starting at about 1 minute prior to the blast and running for about 3 minutes after the blast. I had hoped we could arrange to show it to you this morning, but the arrangement could not be made.

However, we are planning on putting the sound on the film track and if the committee is interested I will be happy about 30 days from now when this is completed, to send Mr. Brewer a copy. It is rather interesting.

Mr. HOLIFIELD. We will arrange to have it shown to the committee.

Dr. TOMPKINS. I believe that completes the formal part of my testimony, Mr. Chairman.

Mr. HOLIFIELD. Is there any question of Dr. Tompkins?

If not, I understand you are going to be with us during the FCDA testimony.

Dr. TOMPKINS. Yes, sir.

Mr. HOLIFIELD. We will depart from the regular order of witnesses in order to hear Dr. Newmark and the FCDA people.

(The testimony of Dr. Nathan Newmark was received at this point and appears beginning on p. 182.)

If we can, we will go back to Dr. White at this time and we will finish up with your witnesses.

STATEMENT OF DR. CLAYTON S. WHITE, LOVELACE FOUNDATION FOR MEDICAL EDUCATION AND RESEARCH, AND DIRECTOR, CETG PROJECT 33

Dr. WHITE. I am Dr. Clayton White, from the Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.

While later on I will talk about the 1955 and 1957 test series with regard to the work that we did in blast biology, I think it is necessary to give a little background to the subcommittee which goes back to the beginnings of our research in the field.

Mr. HOLIFIELD. Will you also qualify yourself, Dr. White?

Dr. WHITE. I am the director of research of the Lovelace Foundation for Medical Education and Research in Albuquerque, N. Mex., where I have been since 1947.

I am a physician from the University of Colorado. I attended the University of Colorado undergraduate school at Boulder and the University of Oxford in England. After finishing medical training I was a medical officer in the United States Navy.

INTRODUCTION

Among the several long-term and short-term alterations in the environment created by nuclear explosions which are hazardous to personnel, those associated with blast phenomena for the most part comprise the subject matter of this presentation.

Personal experience investigating biologic blast effects only dates from 1951 at which time laboratory research supported by the Division of Biology and Medicine of the Atomic Energy Commission was undertaken. Later in 1953 the AEC broadened its investigations of weapons effects by initiating field studies of the biological consequences of blast from nuclear explosions. The work was carried out by a task group from the Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., under the administrative direction of the Civil Effects Test Group of the AEC and marked the beginning of full-scale experience in atomic blast biology. Since 1953 continuous orderly research has been under way both in the laboratory and the field, including programs in 1955 and 1957 carried out in the Nevada test site.

Except for the relatively recent work most of the significant data obtained have been documented and published as detailed in the bibliographic list which is being furnished the committee.

(The document referred to appears on p. 92.)

SCOPE

Blast phenomena are dangerous to animals and man primarily because of the large variations in pressure which are induced by an explosion in soil, water, and air and because of the mass movement of material that surrounds the explosive at the time of detonation, be this earth, water, or air. In the case of the latter, blast produced winds of considerable magnitude can be involved.

It is useful to categorize biological blast hazards under four headings, namely:

1. Primary blast effects which are those associated with the various patterns of pressure variation induced by an explosion and the interaction of the pressure pulse with structures around or near the biologic target;

2. Secondary blast effects which are those caused by the impact of penetrating and nonpenetrating missiles that are secondary to the blast;

3. Tertiary effects incorporating the consequences of physical displacement by blast-produced winds; and

4. Miscellaneous effects which are those involving ground shock and sharp accelerations imparted to a buried structure, dust whether airborne or arising from the walls of an above- or below-surface structure and high temperatures associated with compression, aerodynamic heating, dust and debris and blast-produced fires rather than thermal phenomena attributed to thermal radiation per se.

OBJECTIVES

Three main objectives have guided the laboratory and field investigations. The first has involved the desire to thoroughly and completely understand the primary, secondary, tertiary, and miscellaneous effects of blast on man.

Secondly, elucidation was sought of the relative relation of blast hazards to those associated with other environmental alterations produced by a nuclear explosion, not the least of which concerns prompt ionizing and thermal radiation, residual induced and fallout radiation and fire storm.

Thirdly, last research was influenced by the need and desire to support the practical needs of architects and engineers for biological data essential to the functional design of structures adequate for the complete protection of man.

THE 1951-54 PERIOD

FIELD WORK

During the Upshot-Knothole test series in 1953 biological material was exposed on two occasions in a pair of "open" but instrumented long tubular underground structures, without doors, located about 1,500 feet from ground zero. Recovery of animals following the detonation of a nuclear device approximately 15 kilotons in explosive yield was accomplished and damage was assessed by routine pathological methods.

Some mice were fatally injured by the pressure variations that occurred inside the structure which, in terms of peak pressure varied from about 7 to 25 p. s. i. (pounds per square inch).

Of 44 trained dogs, restrained from being displaced by using custom-fit heavy harnesses, 15 exhibited significant lung hemorrhage and damage in others involved sinus hemorrhages, eardrum rupture, tearing of the lining of the bladder and spotty hemorrhages in other abdominal viscera.

Too, ataxia, a staggering gait, was noted which evidenced some damage to the nervous system. Two anthropometric dummies exposed inside the structures were violently displaced by blast-produced winds.

Mr. HOLIFIELD. Is this the effect of the shock or the blast on the animal organism?

Dr. WHITE. Yes. These were open structures, Mr. Chairman, and the winds and pressure pulses were allowed to enter. This gives one the opportunity to create a pressure environment and winds which are realistic.

Mr. HOLIFIELD. Without hurling the animal against the wall.

Dr. WHITE. That is right. These animals were restrained deliberately because it was appreciated that there would be winds and we wanted to try and segregate the different blast effects and study them as independently as possible.

Mr. HOLIFIELD. How far were they from point zero?

Dr. WHITE. 1,500 feet.

Mr. HOLIFIELD. What size was it?

Dr. WHITE. 15 kilotons, approximately.

Mr. HOLIFIELD. So it is reasonable to suppose that this effect could be extrapolated into the effect on human beings?

Dr. WHITE. Well, possibly. I think we might discuss that later if you like.

Mr. HOLIFIELD. All right.

Dr. WHITE. It is significant that the underground structures were so designed and located as to structurally survive and shield the animals from ionizing and thermal effects. However, the internal environment, otherwise adequate, was hazardous because of blast-associated phenomena: For example, (1) blast winds measured in the center of the shelters created a dynamic pressure (Q) on one occasion as high as 3.0 pounds per square inch equivalent to a wind at sea level of almost 300 miles per hour, and (2) long duration (up to 1 second) overpressures complicated by reflections which resulted in higher peak pressure inside the structures than existed outside. Further, it was noted that severe damage to dogs was associated with the greater (12-25 pounds per square inch) and faster rising overpressures ¹ (>440 pounds per square inch per second), whereas minor damage involved lesser overpressures (7-13 pounds per square inch) and the slower-developing pressure (<440 pounds per square inch per second).

This fact suggested that experimental animals blastwise might well survive primary blast damage in an "open" properly designed shelter even though the outside pressures were 100 pounds per square inch or greater, provided the rate of development of the pressure inside the structure could be controlled to rise slowly enough.

¹ The symbol ">" means "greater than" while "<" means "less than."

Such thinking stimulated activities in two directions; for example, (1) planning full-scale biological experiments from very low to very high pressures for the 1955 Teapot test series, and (2) attempting to design a laboratory pressure source capable of producing the overpressure-time patterns known to be associated with the detonations of nuclear and thermonuclear devices and to exist inside protective structures.

Laboratory work: Laboratory investigations up to 1954 covered studies mostly related to the missile problem. The pathology of building debris was investigated and studies were organized to explore low-velocity missile effects, both penetrating and nonpenetrating in nature. From such studies it became obvious that full-scale missile information was needed to give a background for understanding secondary blast effects. No data covering the weight, size, were available.

Fortunately, from the laboratory work came information which allowed a full-scale missile program to be planned for the 1955 test series. Missile traps using appropriate absorbers were fabricated and calibrated. The technique, if successful in the field, promised to yield quantitative missile information of considerable value.

THE 1954-57 PERIOD

FIELD RESEARCH

Primary and tertiary blast

During the 1955 spring test series over 270 experimental animals ranging in size from the mouse to the dog, located inside 15 separate, instrumented structures comprising 6 different types of above- and below-ground construction, were exposed to the environmental variations associated with nuclear blast.

Range of the several structures varied from 1,050 to 5,500 feet. The most severe alterations in the pressure environment inside the structures followed the detonation of a nuclear device the yield of which was about 50 percent greater than nominal. This weight of explosive produced a side-on ground pressure outside the most forward underground structure which was between twofold to threefold that estimated to exist near the epicenters of the near nominal yield explosions at Hiroshima and Nagasaki.

Physically environmental pressures inside structures varied from 1.3 to 85.8 pounds per square inch and, depending on circumstances, were from about one-third to two times those existing outside the shelters. All animals were recovered after the detonation. In the forward underground structure tested "open" blast-produced fatalities were limited to mice, 1 guinea pig and 1 dog, the latter as a result of violent displacement caused by high velocity winds. Primary blast damage was observed in a few of the other large and small animals, but with the exception of ears and sinuses, was minimal or absent in the larger species.

The overpressure patterns though much higher in peak pressure (up to 85.8 pounds per square inch) were less damaging to animals than the lower overpressures (25 pounds per square inch maximum) of the 1953 experiments, apparently because of changes in design

which altered the configuration of entryways and the shape of the innermost compartments. In contrast, however, the dynamic overpressures near the entryways (Q equaled 12.25 and 12.7 pounds per square inch maximum) proved potentially more damaging.

Of interest to those who contemplate the feasibility of adequate protective construction other observations made during the 1955 field experiment are quite significant as listed below.

1. Dogs, except for rupture of one eardrum, were recovered from a reinforced bathroom and simple leanto shelter located in completely destroyed houses 4,700 feet from ground zero.

2. Rats suffering no blast damage were recovered from a "closed" underground structurally adequate shelter 1,050 feet from ground zero.

3. Even the "open" underground structure at 1,050 feet from ground zero was adequate structurally, functioned fairly well in protecting larger animals from primary blast effects, but was inadequate to avoid tertiary blast effects (displacement) even to strongly tethered dogs.

4. Thermal effects not due to thermal radiation, but probably to aerodynamic heating, compression temperatures, hot gases and dust carried into the forward "open" structures were observed.

5. A few animals from the shelters located at 1,050 feet which were not sacrificed in the blast studies were later afflicted with radiation sickness that proved fatal. This was contrary to the 1953 experience though biologic material was exposed at greater range.

Thus, the 1955 forward structures were not adequate for radiation protection at "close" range, though they might well have been had they been placed deeper in the ground.

It will now be clearly obvious to the committee that the provision of protective structures, the internal environment of which is safe for humans, requires the continuous and close cooperation of a group of knowledgeable individuals, including physicians and biologists who are informed in biological blast effects, radiation and thermal effects; radiation physicists who understand nuclear detonations in relation to yield, distance and shielding; instrumentation engineers whose efforts are necessary to monitor the environmental variations needed to aid proper interpretation of the biological data; and the architect and engineer who must develop adequate design from a synthesis of the best available information, both physical and biological.

Likewise, it certainly seems clear that considerable progress has been made in the past in integrating the efforts of scientists trained in diverse fields. Since there is yet much to learn, a simple fact deserves strong emphasis; namely, physical and biological research in the field of weapons effects must continue both in the laboratory—as will be further supported by later remarks—and full-scale in the field if man is to master the environmental problems created by the advent of nuclear detonations and realize the maximum in protection at reasonable cost.

SECONDARY MISSILES

In 1955 some secondary missile studies were done and the missile-trapping technique mentioned earlier was quite successfully employed in the Teapot Operation and blast energized missiles were captured inside houses and in the open. Over 2,600 missiles were recovered, weighed and their impact velocities determined from calibration data and measurements of their depth of penetration in the absorber—styro-

foam plastic and cork. Fragments of window glass in houses located at 4,700, 5,400, and 10,500 feet from ground zero ranged in velocity from about 70 to 370 feet per second and in weight from near 0.01 to 11 grams. All field data were completely analyzed and a theory, applicable at least to the lower regions of overpressure, was developed which if verified will allow approximate missile velocities to be computed given information concerning distance and the magnitude of a detonation.

LABORATORY RESEARCH

Missiles

Following the 1955 test series laboratory experiments were arranged to reveal the probabilities of glass fragments entering the abdominal cavity of a dog as function of the missile mass and velocity. For fragments near 0.04 grams in weight penetration velocities ranged from near 300 to 1,000 feet per second while for 3-gram particles penetration velocities ranged from only 160 to 400 feet per second.

With these data, assessment of the biological implications of the field data was undertaken. One surprising and interesting outcome of this study was the fact that hazard from flying glass appeared to be greater at a range of 5,500 feet—4 pounds per square inch—than it was at 4,700 feet—5 pounds per square inch—for an explosive yield of about 1.5 nominal. This was true because glass fragments at both 4 and 5 pounds per square inch had about the same mean velocity, but the average mass of missiles was greater at 5,500 feet—4 pounds per square inch—than at 4,700 feet—5 pounds per square inch. The consequence of the mass difference was to increase the probability of a glass fragment penetrating a biological target.

Work on nonpenetrating missiles was continued in the laboratory covering missile weights from near 0.8 down to 0.2 of a pound impacted against the thoracic cavity of experimental animals. Surprisingly enough, and particularly for the lighter missiles traveling at higher velocities, lung lesions closely resembling those of blast were noted in both lungs even though the missile impact was unilateral.

PRESSURIZATION SOURCE

Design of a pressurization source for laboratory blast studies was completed. With funds provided by the Division of Biology and Medicine of the AEC a modified blowdown wind tunnel was installed and instrumented. The blast facilities was and is located on South Sandia Base near the mountains and evaluation of the performance characteristics and the biological potential of the source were undertaken simultaneously. The blast tube proved highly successful, there being no difficulty in creating a variety of pressure-time phenomena involving peak pressures over 200 pounds per square inch and overpressures as long as 20 seconds.

The tub was operated also in physical testing for Sandia Corp. personnel who wished to evaluate the pressure tolerance of rubberized and plastic sheeting to be used in field tests planned for 1957.

TERTIARY BLAST EXPERIMENTS (IMPACT LOADING)

Exploratory experiments with mice, rats, guinea pigs, and rabbits were undertaken to determine their tolerance to dynamic decelerative

loading, an understanding of which is essential to evaluating the decelerative hazard of blast-produced displacement in man.

GENERAL

A critical review of the blast literature was prepared and published in 1954. Likewise, a similar, though more comprehensive and up-to-date critical assessment of the field of blast biology was prepared in 1956 and included in the report of the primary blast work carried out during the 1955 field test series. This is TR-1179, project 33.1 test report.

THE PERIOD 1957 TO THE PRESENT

FIELD RESEARCH

During 1957 Plumbbob test series the field phase of six projects were completed by program 33 civil effects test group personnel. Four of these projects were planned ahead of time and two were conceived and activated in the field. Preliminary evaluation of the results of all six projects has been accomplished and interim test reports are now available. Further analytical assessment of data has been progressing but is far from complete.

PRIMARY AND TERTIARY BLAST EFFECTS

The experiments that dealt with primary and tertiary blast effects will now be described. A total of 562 animals on this occasion ranging in size from the mouse to the dog were exposed in 2 open instrumented shelters each 1,050 feet from 2 separate nuclear detonations. These structures were the same ones used in the 1955 field test operation. Peak internal pressures ranged from 3.8 to 24.5 pounds per square inch. Dynamic pressures near the doorway were close to 11 and 3 pounds per square inch. Mortality due to primary blast effects was limited to 18 and 38 on mice, 2 of 100 guinea pigs, and 1 of 8 pigs. Except for rupture of the eardrum, significant primary blast damage was not observed in dogs though 2 pigs and numerous of the small animals exhibited lung hemorrhages.

One tethered dog was severely injured by decelerative impact following violent displacement from his station near the main entryway. As on previous occasions, skin burns and singeing of the fur of animals were noted. Also delayed mortality attributable to ionizing radiation was observed from 4 to 17 days following the shot.

Simple protective pieces of solid metal plate and metal screens were effective in preventing singeing of the fur and wind displacement of the animal.

Displacement of anthropometric dummies in another experiment by blast-produced winds was studied on two occasions in the open, once successfully with a photographic technique.

In one instance involving maximal static and dynamic pressures of 5.2 and 0.25 pounds per square inch, respectively, a standing dummy was translated 21.9 feet and reached a peak velocity of about 23 feet per second in 0.5 of a second. A prone dummy was not disturbed by the blast.

On another occasion wherein the static and dynamic pressures were 6.6 and 15.8 pounds per square inch, respectively, a standing dummy was translated 256 feet downwind and 43.7 feet to the right (looking away from ground zero), and a prone dummy was blown 124 feet downwind and 19.5 feet to the right (facing away from ground zero).

SECONDARY BLAST EFFECTS

A major missile study was successfully carried out on three separate shots. Missiles captured and analyzed consisted of glass in the open and in houses, "planted" natural and artificial missiles including "military debris," spheres of different masses and diameters, natural missiles (those native to the area), and debris from a concrete block wall. Some work was done in "open" and "closed" underground structures, in the former case to determine the velocities imparted to spheres by internal winds and in the latter case to assess the velocities of particles which might spall or come from the inner concrete surfaces.

Missile experiments and experience in Plumbbob extended previous studies over wider ranges from ground zero and through different explosive yields. In fact, about 200 missile traps were involved in the Plumbbob program which is between six and sevenfold the number employed in the 1955 test series. Postfield evaluation procedures are well underway, though it is too early as yet to appreciate the general applicability of the theory developed from the 1955 data.

Field missile studies from 3.7 to 8.2 pounds per square inch using a biological target were successfully consummated in Plumbbob and pathological work completed. Correlation of biological and physical data must await evaluation of the missile traps exposed near the animal stations. However, 243 wounds from blast fragments were observed in 14 dogs. Lacerations deeper than the subcutaneous tissues were noted in 21 instances and 17 of these involved missiles which could well have entered the abdominal cavity had the impact area been appropriate. These full-scale observations tentatively seemed consistent with missile penetration studies completed previously in the laboratory.

Lung damage in one animal from impact of a nonpenetrating missile was discovered during the routine postshot examinations. Also seen in the other animals were lung hemorrhages attributable to primary blast. These instances involved exposure to a side on P-max of between 8 and 8.5 pounds per square inch.

MISCELLANEOUS

Dust

In the miscellaneous category some dust experiments were performed. Because dust intoxication was known to have been the cause of death in structures subjected to conventional bombing in Germany, a project to study the occurrence of dust inside protective shelters as a consequence of nuclear explosion was conceived and activated in the field through the mutual cooperation of AEC, DOD, and FCDA personnel.

Eighteen underground structures subject to atomic blast during operation Plumbbob were made available. Their locations ranged from 4,320 to 840 feet from ground zero. The existence of consider-

able postshot dust inside the structures was established using "sticky-tray" fallout collectors. Captured particulates arose from the dust on the floor existing preshot in some shelters and from the internal surfaces of the structure. The latter was established by treating the walls and ceilings of four selected shelters with a solution containing a fluorescent dye and subsequently demonstrating that fluorescent particles had been captured by the collectors. The feasibility of dust-collector technique was established as a useful procedure in future evaluation of the internal environment of shelters. Too, the occurrence of fine spalling appeared to be a more sensitive indicator of structural response than gross spalling, an observation, if evaluated further, might result in use of the fluorescent method to indicate structural response at greater ranges than is now possible without using costly instrumentation.

Preliminary studies have indicated that dust as it occurred in the shelters studied would not have been an immediate hazard to occupants. However, the annoying and irritating effects of airborne particulates make it desirable for designers to minimize or completely eliminate blast-produced dust from the interior of protective shelters. Such things as plaster, for instance, must not be used on the inner walls. A thin metal or plastic liner could certainly be useful in stopping the spalling, or in containing the spall particles.

BIOLOGIC ASSESSMENT OF SHELTER ENVIRONMENT

A second project had its inception and activation during the Plumb-bob test series. At the request of the Federal Civil Defense agency, 20 mice were placed preshot inside each of 12 closed underground structures. All were recovered successfully after the detonation. Immediate mortality as observed on recovery, included 19 of 20 mice shielded from radiation only by a sliding metal hatch guarding the entryway to one shelter and 20 of 20 mice from carbon monoxide present in fumes from a gasoline engine driving a power generator, even though the exhaust fumes from the regular exhaust stack were vented to the exterior. No blast lesions were observed in any of the expired animals.

Delayed death of animals which occurred in a 20-day period is noted in the reports and these were presumably of radiation sickness. However, final evaluation must await the not yet complete pathological assessment of tissues from both experimental and controlled animals.

LABORATORY RESEARCH

In 1957 exploratory work was undertaken in the laboratory using the blast-facility shock tube to determine the biological effects of long duration—by this I mean 5- to 20-second duration overpressures of different magnitudes, and which rose to peak values in various times. Maximal pressures ranging from 74 to 170 pounds per square inch rising to a maximum in from about 30 to 155 milliseconds were not fatal to dogs restrained to avoid translational impact. Now the peak pressure inside of the Teapot open structures at 1050 feet were in the order of 66 pounds per square inch rising to a maximum in 90 to 100 milliseconds. The laboratory studies thus bracket the actual field experience in shelters.

Damage in the shock tube studies was limited to eardrum rupture and sinus hemorrhage for all animals and in some instances to wedge-shaped hemorrhagic lesions of the lung. The latter were not observed for overpressures as high as 167 pounds per square inch when the pressure rise was comparatively slow—about 150 milliseconds to maximum pounds per square inch. However, for faster rising pressure pulses going to peak in 30, 60, and 90 milliseconds the wedge-shaped multilesions were a constant finding except for the lower overpressures, that is, below 118 pounds per square inch for the the 90-milliseconds-to-peak rise times and below 86 pounds per square inch for the 30 milliseconds-to-peak rise time.

These laboratory observations confirmed and extended the 1953 and 1955 field test observations, suggesting that the rate of pressure rise was a blast parameter of biological significance and that animals could indeed survive quite high pressures if the "load" was applied slowly enough.

Fatalities from translational impact were noted in some experiments from winds accompanying the blast tube overpressures which ranged from 57 to 103 pounds per square inch maximum with rise times of 44 to 90 milliseconds. In one case an impact fatality occurred following only a 9-inch movement of the test animal.

Recent additional studies with the shock tube are of considerable basic significance. Five- to twenty-second duration pressure pulses rising in a matter of a few hundreds of microseconds have been employed to establish mortality curves for guinea pigs, mice, and rats.

In one series of experiments—to use the guinea pig results as an example—metal-mesh cages (the same as those used in the field) were bolted to the end of the shock tube and animals were exposed to the almost instantaneously rising pressures developing from the primary shock and its reflection from the end of the tube. Reflection causes a pressure again of twofold to threefold that in the primary shock and the amount of increase depends upon the magnitude of the primary shock pressure. Using 140 animals, a mortality curve was determined. The pressure required to injure fatally 50 percent of the animals, or the P-50 figure, was about 36 pounds per square inch. The standard deviation was 5.37 percent. Pressures associated were 5 and 95 percent mortality and were nearer 29 and 44 pounds per square inch, respectively.

A second series of 111 guinea pigs was likewise exposed except that the cages were not located right on the end but 1 foot from the end plate of the shock tube. These animals were exposed to a stepwise increase in pressure which involved 2 fast-rising pressure pulses. The first step involved the overpressure accomplishing the primary shock which came down and passed over the cage while the second involved the increase in pressure as a consequence of the reflection from the end of the tube, which reflected back and traveled back over the cage. This second pressure rise was superimposed upon the shock pressure slightly less than 2 milliseconds following the arrival of the primary pulse. Using the maximum pressure associated with the reflected shock (Pr) as the significant parameter, mortality curves were plotted and the P-50 surprisingly enough, proved to be approximately 57 pounds per square inch, instead of 36 as I noted a moment ago, with a standard deviation of 10.3 percent. Mortalities of 5 and 95 percent

were associated with reflected pressures near 46 and 70 pounds per square inch, respectively.

It is important to realize that for the animals located against the end plate of the shock tube, the primary shock pressure associated with the P-50 value of 36 pounds per square inch for the reflected pressures was close to 14 pounds per square inch. For the P-50 reflected pressure of 57 pounds per square inch for animals located 1 foot from the end of the closed tube, the incident or side-on pressure associated with the primary shock was close to 20 pounds per square inch.

These observations are most significant because: (1) The pressure conventionally spoken of in the pressure-distance-yield relations for nuclear explosions are static pressures and are not comparable to the reflected pressures quoted for the shock tube data. Rather they are comparable to the primary shock pressures. (2) The importance of the geometry of exposure of a biological target is clearly emphasized as are the dangerous natures of positions close to reflecting surfaces and the necessity to design shelters to avoid the development of sharp pressure reflections inside. (3) A laboratory tool is now at hand to explore further the biological significance of various rates of pressure loading, from long duration pulses incorporating multiple, sharp, stepwise components during the rising phases of the overpressure.

DISCUSSION

By way of discussing the data briefly summarized above and noting their relation to protective construction, a few points deserve emphasis. First, it can be said that blast biology studies are progressing and the relation of these investigations to protective construction is fairly well advanced. Secondly, the problem of protection for survival requires adequate measures to survive the first seconds, then minutes, hours, days, and months. Thirdly, appreciation of the gamut of environmental alterations produced by a nuclear detonation as a function of distance, weapon type, topography, and height of burst sets the problem for the protective designer who, for a given location, must ask what are the likely overpressures, winds on the surface, and ground shock beneath the surface? What is the thermal flux? What are the anticipated levels of prompt ionizing radiation and those due to induced and fallout phenomena?

One logical approach to protective design can well be visualized as including those measures to combat:

1. NUCLEAR DETONATIONS

(a) Immediate or early effects, such as (1) thermal radiation, (2) prompt, induced, and fallout ionizing radiations, (3) blast overpressures and ground shock, (4) winds responsible for pressures, missiles, dust, and displacement damage to human targets, (5) blast associated fires, (6) interruption of utilities potentially hazardous because of flooding from ruptured water mains, explosions, and toxicity from gas escaping broken lines and power failures and interruption of ventilation, and (7) danger from industrial materials peculiar to certain areas—toxic chemicals, reactors, powder and fuel plants and the like.

(b) Delayed or late effects, such as (1) fire storm, (2) persisting induced and fallout ionizing radiations, (3) persisting lack of utilities (light, heat, and water, garbage and sewage disposal), communications and transportation (food and water, medical aid and supplies).

2. OTHER WEAPONS

One must think of other weapons of use to a potential enemy and be prepared for attack with BW and CW agents as well as conventional explosives and armament.

Keeping the above in mind, it is obvious that planning to provide complete protection in case of war is a very complex matter, indeed. However, the situation is not, in fact is far from a hopeless one technically. First, it is necessary to recognize that protection for survival can be a potent factor in improving the war deterrent and the retaliatory postures of the United States and her allies. Secondly, even in peacetime safety really is a relative matter and the objectives of protective construction should be to sharply minimize casualties and hence maximize survival. In truth, casualties in the high millions could occur without protection, while with protection even under massive attack they could be held to thousands or at the most to the low millions. The significance of this last statement needs little further comment, though the contribution blast, radiation, and thermal prophylaxis, if actually practiced, could make in easing the tasks of the medical profession in time of crisis deserves the strongest possible emphasis.

Finally, what is known of primary, secondary, tertiary, and miscellaneous blast effects along with the events exemplified by the two Japanese nuclear explosions and the Texas City disaster in 1947—all of which can again take place in unprepared urban areas—forms a potent, almost unassailable argument for protective construction. Too, biological blast data can contribute to the design of shelters, particularly simple structures useful in sparsely populated areas especially those in the fringe or relatively low-pressure areas surrounding prime target complexes. Synthesis of all physical and biological effects information into a design concept to provide internal environments acceptable to man, complete with necessities not luxuries, is certainly possible and perhaps quite feasible. At any rate, such thinking provides an encouraging vision which is a hopeful thought appropriate to closing this discussion.

SUMMARY

1. A brief summary of laboratory and field research carried out since 1951 dealing with the biological effects of blast from bombs was presented.

2. The scope of blast biology was defined as including primary (pressures), secondary (missiles), tertiary (displacement), and miscellaneous (dust and nonradiant thermal phenomena) effects and the objectives of past and current investigations were noted.

3. Experiments with and without test animals carried out by a blast biology task group in the 1953, 1955, and 1957 Nevada field test operations were described, including instances of recovery of living animals from underground structures tested "open" which were placed

as close as 1,050 feet from a nuclear device, the yield of which was about 1.5 nominal. At this location the pressure outside the structure was between twofold and threefold that estimated to exist near the epicenters of the explosions at both Hiroshima and Nagasaki.

4. Laboratory investigations encompassing additional assessment of field data were noted. These included the biological effects of penetrating and nonpenetrating missiles, the pathology of building debris, dynamic decelerative impact loading and the design, construction, and operation of a modified blowdown wind tunnel as the major piece of equipment in an unusual blast facility conceived primarily for biological blast research.

5. The fact that biological blast data concerned only one facet of weapons effects was emphasized as was the requirement for the designer of protective structures first to synthesize all known physical effects information in order to appreciate the environmental alterations against which man must be protected, and secondly, to gather biological effects and related findings to assure that the environment "created" inside a shelter would indeed be acceptable to human occupants.

(NOTE.—Bibliographic list attached. Other significant papers are noted in the reference lists of the documents noted.)

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12. "Missile Studies with a Biological Target," V. C. Goldizen, D. R. Richmond, and T. L. Chiffelle, Operation Plumbbob Report ITR-1470, November 29, 1957.
13. "The Internal Environment of Underground Structures Subjected to Nuclear Blast. I. The Occurrence of Dust," C. S. White, M. B. Wetherbe, and V. C. Goldizen, Operation Plumbbob Preliminary Report ITR-1447, November 22, 1957.
14. "The Internal Environment of Underground Structures Subjected to Nuclear Blast. II. Effects on Mice Located in Heavy Concrete Shelters," D. R. Richmond, T. L. Chiffelle, R. T. Sanchez, and J. D. Ward, Operation Plumbbob Report ITR-1507, November 29, 1957.

Classified reports

15. "Effects of Overpressures in Group Shelters on Animals and Dummies," Operation Upshot-Knothole Report WT-798, J. E. Roberts, C. S. White, and T. L. Chiffelle, September 1953 (Conf. RD).
16. "The Biological Effects of Blast—A Critical Review," Clayton S. White, Report TID-5251, U. S. Atomic Energy Commission, Technical Information Service, Oak Ridge, Tenn., September 15, 1954 (Conf. RD).
17. "Engineering Aspects of the Effects of Overpressures on Ground Group Shelters," James Clark and Robert Crawford, Operation Upshot-Knothole, Project 23.15, submitted to R. L. Corsbie November 12, 1954.
18. "The Biophysics of Penetrating Missiles—Conditions Critical for Penetration," I. G. Bowen, J. P. Henry, W. H. Lockyear, M. A. Palmer, D. R. Richmond, and C. S. White, Report TID-5284, U. S. Atomic Energy Commission, Technical Information Service, Oak Ridge, Tenn., January 4, 1955 (Conf. DI).
19. "Distribution and Density of Missiles from Nuclear Explosions," I. G. Bowen, A. F. Strehler, and M. B. Wetherbe, Operation Teapot Report WT-1217, March 1956 (Conf. RD).
20. "The Effects of Noise in Blast-Resistant Shelters," F. G. Hirsch, Joan Longhurst, D. R. McGiboney, and H. H. Sander, Operation Teapot Report WT-1180, submitted to R. L. Corsbie, June 12, 1956.
21. "Missiles Secondary to Nuclear Blast," I. G. Bowen, R. V. Taborelli, and V. R. Clare, Operation Plumbbob, Report ITR-1468, March 31, 1958 (Conf. FRD).

Thank you, Mr. Chairman. I am grateful to you, too, for making it possible for me to come here today instead of yesterday.

Mr. HOLIFIELD. You are certainly very welcome. Thank you for your testimony today.

This will conclude, Mr. Corsbie, your list of witnesses, I believe.

Thank you for bringing them to us and for the testimony that they have given. We will start in at 10 o'clock in the morning with the FCDA witnesses; Mr. Gallagher and his associates will be before us at that time.

Thank you all for going through this long hearing. I thought it was necessary to get it off of the board today.

(Whereupon, at 1:15 p. m. the subcommittee adjourned to reconvene at 10 a. m. Friday, May 2, 1958.)

CIVIL DEFENSE

Part I—Atomic Shelter Tests

FRIDAY, MAY 2, 1958

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS,
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met in room 1501-B, House Office Building, pursuant to adjournment, at 10 a. m., Hon. Chet Holifield, chairman of the subcommittee, presiding.

Present: Representatives Holifield, Fascell, Griffiths, Lipscomb, and Minshall.

Also present: Herbert Roback, staff administrator; Carey Brewer, senior defense specialist; Paul Ridgely and Robert McElroy, investigators.

Mr. HOLIFIELD. The subcommittee will be in order.

This morning we have as our first Federal Civil Defense Administration witness Mr. Gerald Gallagher, Assistant Administrator for Research and Development. I understand that you have a statement to make, Mr. Gallagher, and also that you will introduce the succeeding witnesses. You may proceed, sir.

Mr. GALLAGHER. I have a very brief statement, Mr. Chairman.

STATEMENT OF GERALD GALLAGHER, ASSISTANT ADMINISTRATOR, RESEARCH AND DEVELOPMENT, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. GALLAGHER. It is our aim this morning to give the committee a streamlined review of some of the technical activities of the Federal Civil Defense Administration which bear on the problem of shelters for protection against nuclear weapons as well as certain other activities relating to the protection of people.

Following this brief general statement, I propose to have several FCDA staff members and some other gentlemen who have advised and assisted us in various parts of this program either as consultants or research contractors to pick up various parts of the problem for presentation and discussion.

Your kindness in fitting Dr. Newmark into yesterday's hearing was very much appreciated, sir. There are eight people in all whom I would like to introduce today for short presentations. This will probably be a tight schedule and I would like to make it clear, Mr. Chairman, if you desire more extended treatment of any parts of this program we will be very happy to arrange it.

Mr. HOLIFIELD. Well, we do not want to leave out any pertinent parts. We do not want to go into great detail because much of the detail can be furnished to us in additional material.

Mr. GALLAGHER. Yes, sir.

Mr. HOLIFIELD. But at the same time we do not want to slight anything that in your opinion needs to be told to this committee. This is going into the printed record and we want our record of the pertinent and important facets to be as complete as possible. The details can be furnished in prepared memorandums.

Mr. GALLAGHER. If we run short of time, we might submit the statements for the record and perhaps you would want to question or have a short discussion with the individuals.

Mr. HOLIFIELD. All right.

Mr. GALLAGHER. I think the question paramount in your minds this morning is just how ready are we from a technical standpoint to undertake a national shelter program.

I can say with complete sincerity that I think we are ready to provide guidance in the design and construction of shelters throughout the Nation which will guarantee a high level of survival to the people of the country. This is not to say that we have final answers on all subjects, nor that we do not need to continue research aimed at developing more economical and more effective shelters, and we must give greater attention to the problems of human reaction and shelter habitability.

This we are doing now and this we propose to continue. However, I think the presentations which follow will support my statement that we can design and build effective shelters at this time.

The committee is fully aware that the subject of protective shelter has been under consideration by the executive branch.

On December 21, 1956, the Federal Civil Defense Administration presented a proposed national shelter program. A shelter program would have such serious implications in the economic field and in international relations and in its relationship to the military effort that it must be of concern to the entire Government.

For this reason our proposal was taken to the highest executive branch level and for this reason the consideration given to the proposal has been thorough and painstaking.

Since we submitted our program, the problem has been under close study in all affected agencies. It can be expected that in due course a definitive administration policy relative to shelter will emerge. In the meantime, we have been pushing research and development in the shelter field as rapidly as staff and funds have permitted. That is the end of my brief statement, sir.

Mr. HOLIFIELD. You say the FCDA has proposed a shelter program to the President?

Mr. GALLAGHER. That is right; yes, sir.

Mr. HOLIFIELD. When was this proposed, Mr. Gallagher?

Mr. GALLAGHER. Our proposal was, as I have said, on December 21, 1956, the original proposal.

Mr. HOLIFIELD. Now, what was the course of procedure on that proposal? It was sent to the office of the President. Where was it referred then?

Mr. GALLAGHER. Well, I would be unable to say with any certainty where it was referred. I know only that it has been under study by the affected agencies.

Mr. HOLIFIELD. It was referred to the National Security Council, was it not?

Mr. GALLAGHER. They have had it under consideration; yes, sir.

Mr. HOLIFIELD. Subsequent to that referral the Gaither committee was formed, was it not?

Mr. GALLAGHER. Yes, sir, that is true.

Mr. HOLIFIELD. Was this study turned over to the Gaither committee for scrutiny and study?

Mr. GALLAGHER. I think it was one of the inputs in their study; yes, sir.

Mr. HOLIFIELD. It is reasonable to suppose, then, that the Gaither committee, having had this study under consideration, made some conclusions in regard to the recommendations in this study, is it not?

Mr. GALLAGHER. Yes, sir.

Mr. HOLIFIELD. Now, we understand, of course, that the Gaither committee report has been restricted because of it being a study for the executive department. That is true, is it not?

Mr. GALLAGHER. That is true; yes.

Mr. HOLIFIELD. And you are not at liberty to testify on the findings of the Gaither report?

Mr. GALLAGHER. I am not.

Mr. ROBACK. With regard to the findings of the Gaither committee, do you believe it was their job to undertake consideration of the shelter proposal or was it a broader function?

Mr. GALLAGHER. It is my understanding they had a broader function. They were to relate shelter, the passive defense aspects to the active defense considerations.

Mr. ROBACK. But the proposal by the FCDA, in effect, gave rise to some consideration by the Gaither committee along that line?

Mr. GALLAGHER. This is a correct statement; yes, sir.

Mr. ROBACK. Now, in regard to the Gaither committee recommendations, was a copy of the report submitted to the FCDA?

Mr. GALLAGHER. We have seen the reports.

Mr. ROBACK. You have seen the reports?

Can you tell the committee whether the Rockefeller committee, in making its reports on shelters, came to the FCDA to consult with you or to ask questions about the problem?

Mr. GALLAGHER. I have no knowledge that they did. We have been in touch with different people who were Rockefeller associates and I suppose indirectly at least that they are familiar with our thinking. If the inference is that we conveyed information to the Rockefeller group, this is not so. We did not.

Mr. ROBACK. I was not making any inference. I wanted to know whether this was a general recommendation on their part or whether this was based upon consultation with the FCDA?

Mr. GALLAGHER. There was no formal consultation with us.

Mr. LIPSCOMB. Mr. Chairman.

Mr. HOLIFIELD. Mr. Lipscomb.

Mr. LIPSCOMB. How long has FCDA been prepared to design and build an effective shelter program?

Mr. GALLAGHER. Well, I think, sir, that Dr. Newmark addressed himself to that in some degree yesterday in saying that an engineer at any time will build a structure to meet a requirement. He may not build it well or effectively or efficiently.

I would say that we have been prepared in our view to design and build efficient and effective shelters since the time we made the proposal on the construction program.

Mr. LIPSCOMB. And was that included in your construction proposal?

Mr. GALLAGHER. The proposal went only to the degree of protection and the location of this protection in the country and the estimated cost. Do you mean did the design details go into that proposal? No, sir.

Mr. LIPSCOMB. You said in your statement that you are prepared to design and build an effective shelter program.

Mr. GALLAGHER. We think, as I think you will see later in some of these presentations, there is sufficient design, know-how, to build all kinds of shelters.

Mr. LIPSCOMB. Have you revised or brought up to date your proposal of December 21, 1956?

Mr. GALLAGHER. It would be more accurate to say that we have or are prepared to amend that proposal in the direction of—well, we can go in either direction, either raising the level of protection proposed at that time or lowering it to the consideration of fallout only, which is an active consideration at this time.

Mr. LIPSCOMB. Do you have a policy?

Mr. GALLAGHER. We are awaiting a policy.

Mr. LIPSCOMB. What is your opinion? Do you think you ought to lower it?

Mr. GALLAGHER. My own view is that we ought to have blast shelter, sir, but there is such a promise of saving of lives in fallout shelters that if this is the end from the feasibility standpoint, this will be a great accomplishment.

Mr. LIPSCOMB. Well, is FCDA adjusting their thinking to what they think to be a program by the Executive or do you have a program of your own that you would like to tell Congress about?

Mr. GALLAGHER. We will adjust to the policy as it emerges; yes, sir.

Mr. HOLIFIELD. You make your recommendations, in other words, as to what you think would be feasible under certain alternative plans, and then when the policy is set at the Presidential level, of course, your testimony is that you would naturally comply with it.

Mr. GALLAGHER. That is right; yes, sir.

Mr. LIPSCOMB. Well, was this proposal of December 21, 1956, what you felt was feasible?

Mr. GALLAGHER. This had the elements of feasibility as we saw them then. The highest level of protection we proposed was 30 pounds per square inch in blast protection. This begins to get into the area of rapidly decreasing return from the standpoint of investment in relation to what you get for it. What I mean is that the pressure-distance curve, it can be demonstrated, at the 30 pounds per square inch level begins to shoot up rapidly so for relatively short distances toward ground zero which implies a relatively small area, you spend

a great deal of money to get an additional level of protection, so at that time we said that the 30 pounds per square inch seemed to be a reasonable, feasible compromise. Our program was essentially a combination of 30 pounds per square inch shelters and fallout shelters.

Mr. HOLIFIELD. That seems a reasonable level to me from the study that I have made. I recollect that if you tried to take care of pressures that run up into the hundreds of pounds per square inch, the economic factor becomes so great that you just cannot do it without completely disrupting every other activity of our economy. No one wants to do that.

Mr. GALLAGHER. We still find this to be a defensible, logical position, although, Mr. Chairman, as the testimony will show, we are looking at and thinking about a number of other things. We do not have our minds closed.

Mr. HOLIFIELD. Well, this committee does not have its mind closed either. That is why we have a hearing.

Mr. ROBACK. From a budgetary standpoint, the budget directors say, looking over the policy which costs money, that if they had a blast and radiological shelter proposal, from the budgetary standpoint it would be cheaper to limit oneself to the decision on the radiological shelter, is that right? I mean from the standpoint of reducing the cost.

Mr. GALLAGHER. Well, the radiological shelter would be considerably less costly than a blast-shelter program.

Mr. ROBACK. And if one was concerned about the cost element, the next consideration you would have would be to decide how much existing shelter there is in the country that could provide such protection, so you would not have to make the dirt fly.

Mr. GALLAGHER. This is true, too. This will be a part of our presentation. This will be of highest importance, to see what we actually have now.

Mr. HOLIFIELD. I think in view of what has been said in this interchange of questions and answers, it would be well then to proceed with the testimony and then resume the questioning after we have seen what you have to present, because we may be asking a lot of questions which you will answer now.

Mr. GALLAGHER. I think that is true. The committee has expressed a lot of interest in the tests in 1957 in Nevada. Mr. Saunders will be our first witness. He will discuss in some detail last year's test program.

Mr. HOLIFIELD. Before he starts his testimony, will you please, for the record, Mr. Gallagher, give us a statement of your relationship with the Atomic Energy Commission in these tests?

What is the general working relationship you have?

Mr. GALLAGHER. We are a part of the Civil Effects Test Group which Mr. Corsbie, who was here yesterday, heads. Mr. Saunders was carried as Assistant Director, so we worked right with that group in Nevada.

Mr. HOLIFIELD. You work on a parallel basis and coordinate your actions, you might say, on the same level of authority, or was the AEC in charge of the tests?

Mr. GALLAGHER. It is an AEC facility. They are in charge. We comply with their rules and conform to their directions.

Mr. HOLIFIELD. Did you have any difficulty in working with the AEC people in regard to control of the types of tests that you wanted to make?

Mr. GALLAGHER. I have no recollection of any trouble; no, sir. These projects are reviewed by a screening committee in the middle of the year preceding the tests or at least in early fall, and this is an AEC committee. Is it interagency?

Mr. SAUNDERS. It is interagency; yes.

Mr. GALLAGHER. So this is supposed to be an objective group that looks at these things and says this is important, or this has been done better somewhere else or could be done better, so they shake down to an agreed series of projects.

Mr. HOLIFIELD. Would you say, Mr. Saunders, that you had full cooperation from the AEC in these interagency operations?

Mr. SAUNDERS. Yes, sir.

Mr. HOLIFIELD. You were not restricted and hedged with rules and regulations which made it difficult for you to accomplish your objective?

Mr. SAUNDERS. Well, rules and regulations, I suppose, always make the job a little more difficult, but I would not say it was necessarily objectionable.

Mr. HOLIFIELD. In other words, the rules and regulations were not unreasonable, looking at it from the AEC standpoint, from the standpoint of security and safety?

Mr. SAUNDERS. No, sir.

Mr. HOLIFIELD. All right, Mr. Gallagher.

STATEMENT OF EDWARD SAUNDERS, DIRECTOR, TEST OPERATIONS, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. SAUNDERS. Mr. Chairman, members of the committee, the Federal Civil Defense has participated in practically every nuclear weapons test program since 1951 either with a technical program or observer program, and in many cases both.

Our participation in these tests has increased with every series from representation at Operation Greenhouse in 1951 to the complex and comprehensive test program in the summer of 1957.

The technical test program includes a wide variety of experiments. FCDA has emphasized shelters and radiological defense and its tests have greatly influenced the agency programs. Throughout the tests our programs have kept pace with the development of nuclear weapons. All FCDA projects are designed—those included in nuclear weapons test series—for the following purposes:

1. To determine the nuclear weapons effects data and develop basic technical information.
2. To field or "proof" test equipment, instruments and structures.
3. To train specialists in various phases of nuclear weapons defense activities with emphasis placed on radiological defense.
4. To familiarize key civil defense personnel—Federal, State, and local officials—with civil defense problems and responsibilities.
5. To assist in carrying out the FCDA responsibility for the public education in the nuclear weapons effects area.

There are three basic programs designed to accomplish these objectives; the technical test program which functions under the civil

effects test group in Nevada, and is responsible for obtaining basic weapons effects data, field testing and training. The observer program familiarizes civil defense personnel with civil defense problems by direct observation of the nuclear weapons effects. The test information program was established to assist the Atomic Energy Commission in educating the public in the area of nuclear weapons effects.

FCDA participation in nuclear weapons tests is carried out in close cooperation with other Federal agencies to insure maximum benefit to all agencies engaged in test activities and to avoid any duplication of effort.

All projects are screened by an interagency committee prior to acceptance in the test program. FCDA invites and assists most other Federal civilian agencies in executing projects of common interest or programs having civil-defense implications.

State and local government officials are also given an opportunity to participate either in our observer program or in our training programs. Industry also participated under FCDA sponsorship. If industry is in need of information relating to nuclear weapons effects not otherwise available and if a civil defense value is to be derived, FCDA will sponsor the proposal. Over 200 industries have donated \$21½ million for test projects since 1953. In the test series just concluded, Operation Plumbbob, FCDA arranged for the French and West German Governments to test their civil-defense shelters using their designs and many of their components.

Since 1951 FCDA has had staff observation in every test series. We have invited official observers, including news mediums, to every continental test from Operation Upshot Knothole in 1953 through Operation Plumbbob in 1957.

The number of observers has varied from 250 to 1,300 persons per series.

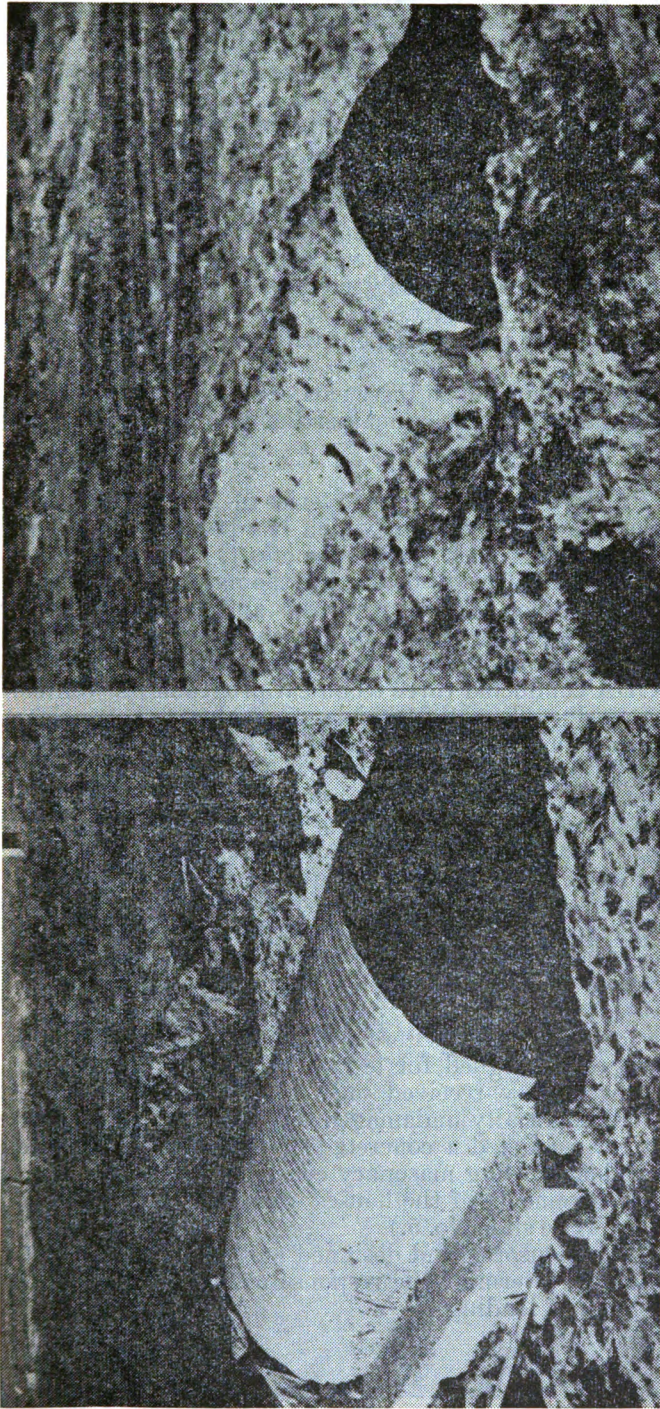
In the fall of 1951 in the Buster-Jangle series, FCDA began sponsoring technical participation. A contract was executed with the Lehigh University Institute of Research to prepare a series of manuals on shelters. With the assistance of FCDA, Lehigh designed a number of family shelters. Before approving the manuals we determined the effectiveness of the proposed structures by field testing.

A total of 29 simple structures were tested; 18 were covered trench type, 5 metal arch, 4 wood arch, and 2 basement lean-to structures. The structural strength, materials, amount of earth, elevation, and orientation were varied for test purposes.

(See slide No. 1.) Shown here is a covered trench-type shelter which is typical of the structures tested. This is a corrugated metal-arch structure prior to and after being exposed to the blast. (See slide No. 2.) All 29 shelters were exposed to three detonations with varying pressures from about 10 to 15 pounds per square inch. The test structures were severely damaged by the three explosions, but considerable useful data were obtained.



SLIDE No. 1.—Covered trench-type shelter.



Slide No. 2.—Corrugated metal-arch structure prior to and after being exposed to blast.

The tests showed that small shelters could provide a degree of protection commensurate with protection necessary at that time. At that time only small weapons had been designed. The information was used to design safer shelters for that period.

Mr. HOLIFIELD. As these shelters are shown here, would you please identify the year in which the test occurred or do they all refer to 1957?

Mr. SAUNDERS. No, sir; these shelters were tested in 1951.

Mr. HOLIFIELD. All right, as you present the different shelter pictures, give us some information as to when they were tested, and also the pounds per square inch they were subjected to.

Mr. SAUNDERS. Yes.

Mr. HOLIFIELD. I imagine your statement will give most of that but be sure to include it.

Mr. SAUNDERS. It does, sir, but in these earlier tests I have skipped over a lot of the detail because it is not pertinent to the hearing of today.

Mr. HOLIFIELD. Yes.

Mr. SAUNDERS. In the Tumbler Snapper series of 1952, FCDA initiated a radiological defense program which has been continued in every continental test series with increasing effort. The objectives of the radiological programs are to determine the nature and magnitude of the nuclear radiation hazard, field tests and evaluate instruments, establish survey and decontamination techniques, and provide training and develop training materials. During Upshot Knothole series, in 1953, FCDA conducted three technical programs: A vehicle test program was conducted on 100 vehicles to evaluate the nuclear weapons effects on automobiles, trucks, and buses.

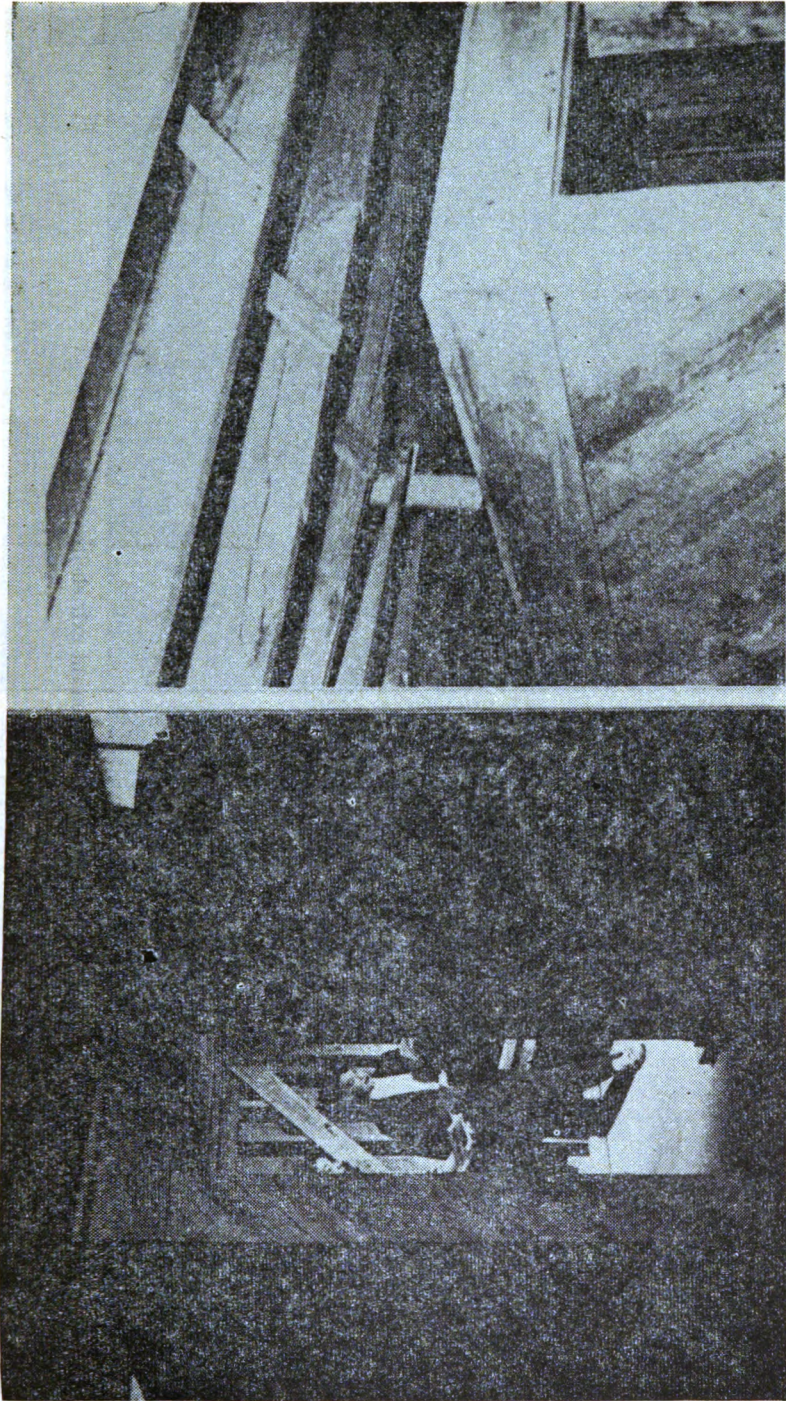
A radiological defense operations program was conducted to accomplish the radiological defense objectives outlined earlier, including the first on-site training course. A program was conducted to determine the response of conventional framehouses at 2 and 5 pounds per square inch and to determine the adequacy of family shelters against pressures from 2 to 45 pounds per square inch.

This is a basement corner room shelter tested in the houses at 2 and 5 pounds per square inch. Note the minor damage done to the floor joists causing no debris load on this particular shelter. (See slide No. 3.)

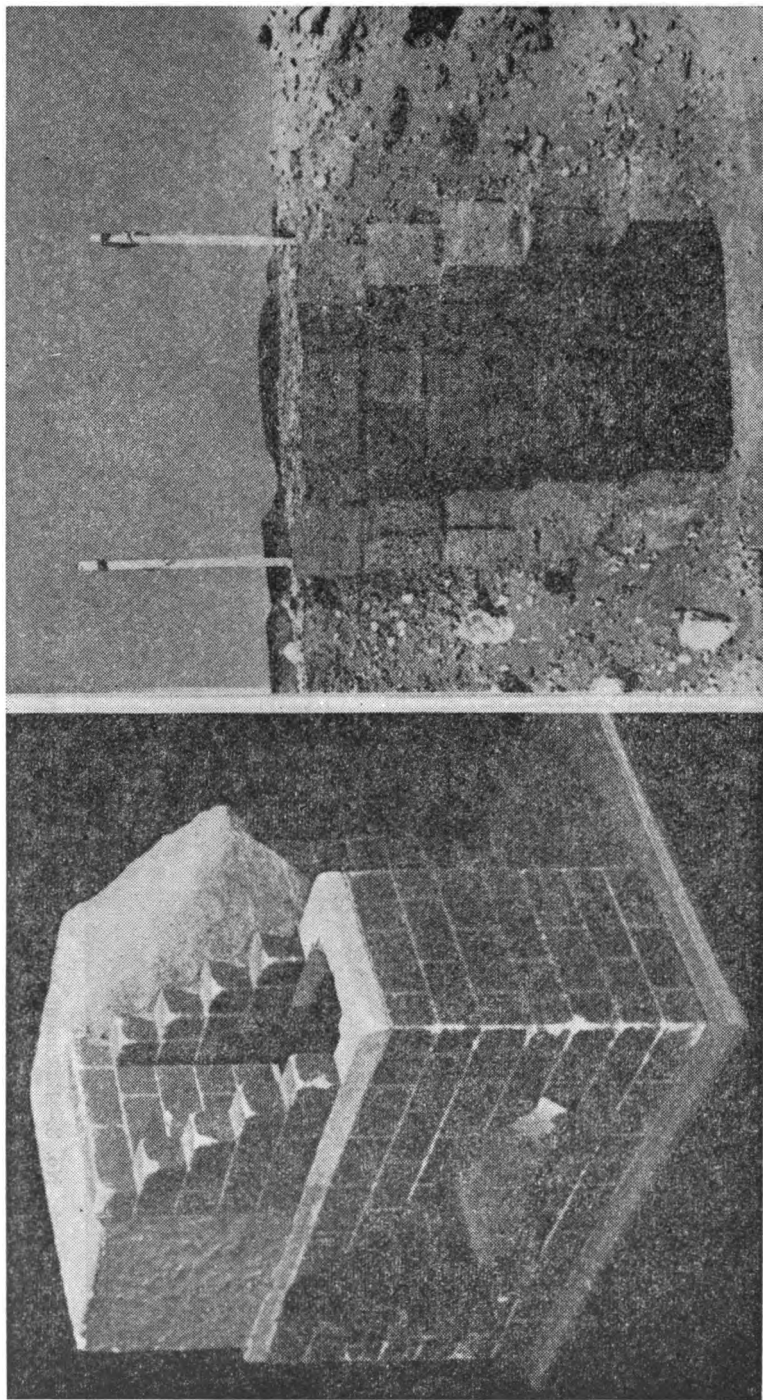
A model of the basement exit shelters and the completed shelter is shown here. They were designed for tests at 20 and 45 pounds per square inch. However, they received only 10 and 20 pounds per square inch and were essentially undamaged by the blast. (See slide No. 4.) In addition, we tested a concrete-type shelter and retested the covered trench shelter using masonry construction.

Also tested in the basements of the houses were lean-to type structures as shown here. (See slide No. 5.)

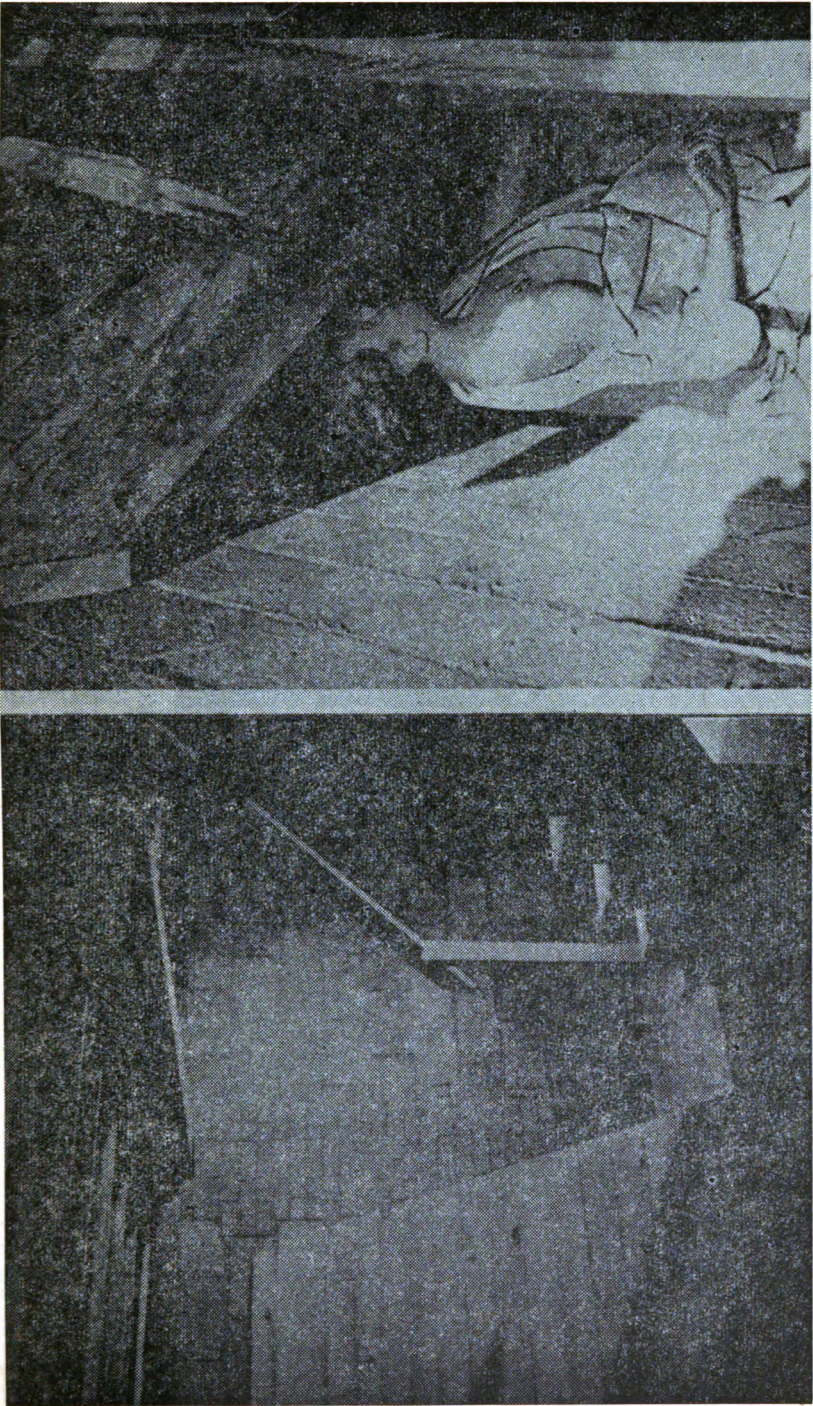
In addition, FCDA sponsored and designed and conducted a half-billion-dollar project to determine the response of curtain walls and interior partitions to blast loading.



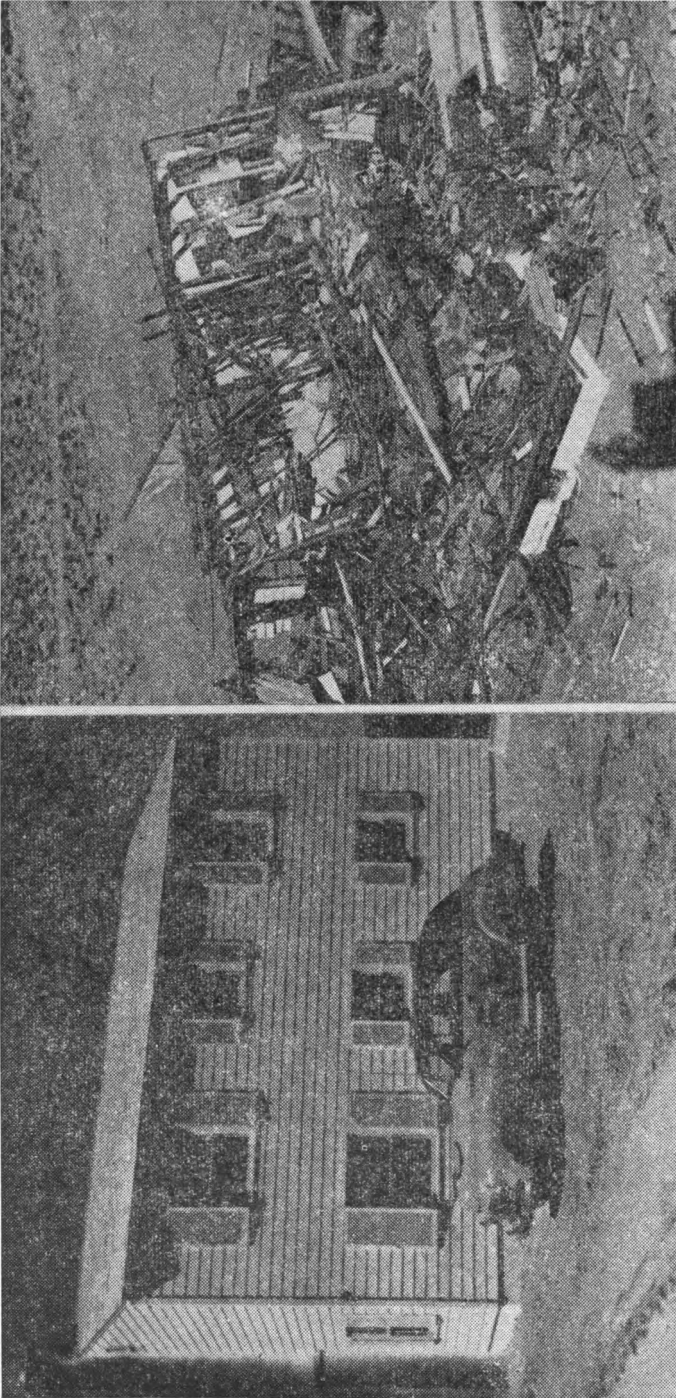
SLIDE No. 3.—Basement corner room shelter tested in the house at 2 and 5 pounds per square inch.



Slide No. 4.—Basement exit shelters.



Slide No. 5.—Basement lean-to type structures.



Slide No. 6.—Typical frame house before and after being exposed to 5 pounds per square inch.

From the 1953 tests it was apparent that: (1) a conventional frame-house will be severely damaged at a pressure range of 2 pounds per square inch and destroyed at 5 pounds per square inch. (See slide No. 6.) (2) The damage inside of the houses indicated that persons without shelter exposed to 5 pounds per square inch would have been killed or severely injured.

(3) Indoor shelters should be tested under substantial debris loads.

(4) All future tests should include instrumentation to measure interior as well as exterior temperatures and pressures.

The shelter designs were modified for the FCDA home shelter manual. The results obtained aided in defining the criteria for shelters, and the development of standards to provide protection from a nominal size atomic weapon.

In 1955, we participated in Operation Teapot. Through the cooperation of other agencies and about 200 industries, FCDA conducted its most extensive technical program to that time. The programs sponsored by FCDA were:

(1) Response of residential, commercial, and industrial structures and materials.

(2) Exposure of foods and foodstuffs.

(3) Utilities, services, and associated equipment.

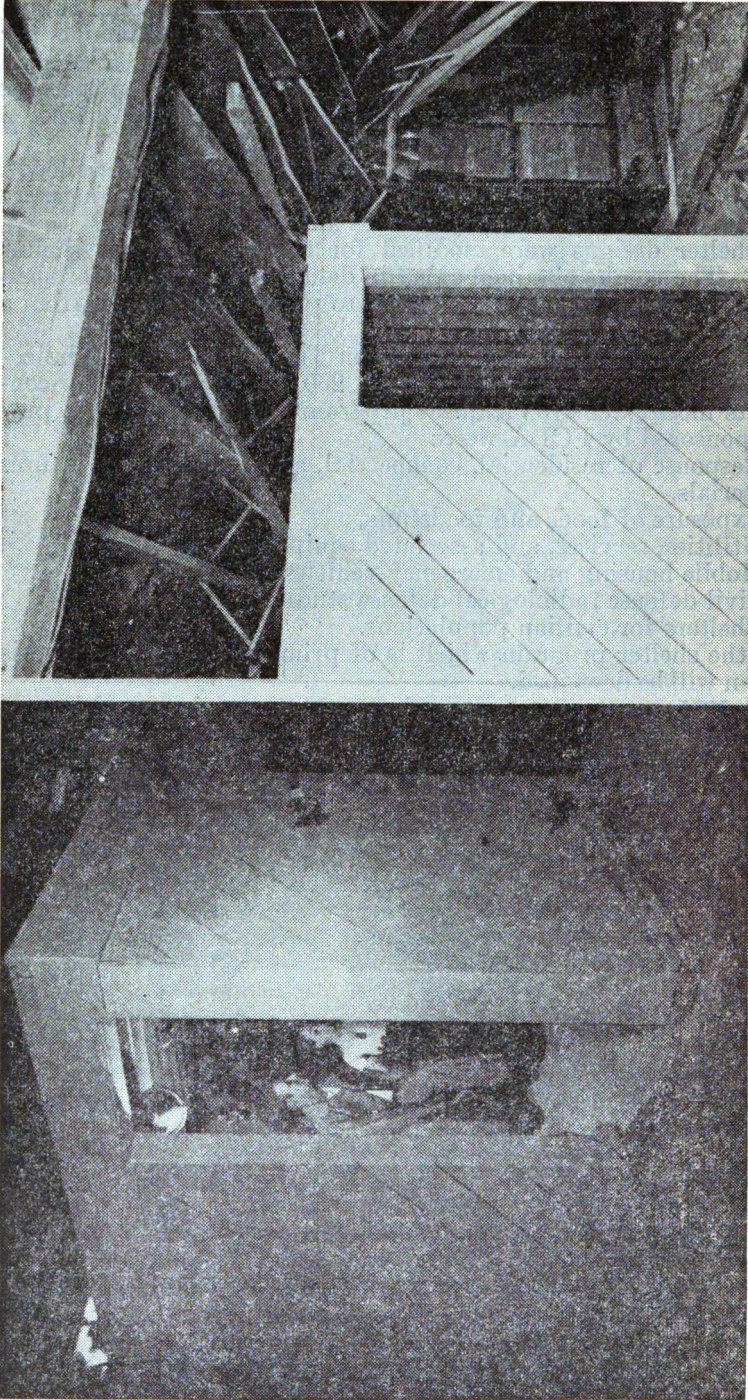
(4) Mobile housing and emergency vehicles.

(5) Civil defense radiological defense studies.

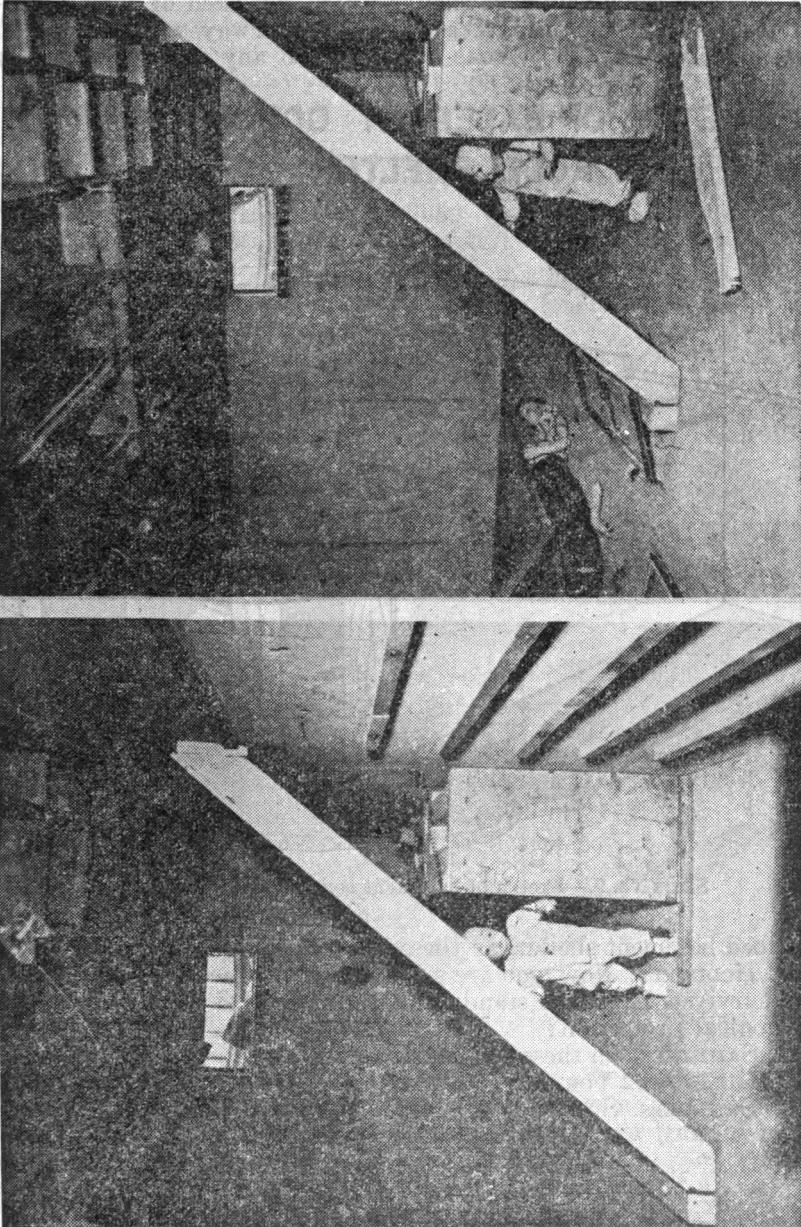
(6) Shelters for civilian populations.

Only the shelter program which is of primary importance to this discussion will be described.

In the 1955 series, corner-room shelters as shown here and lean-to type shelters were tested in all test houses with basements. (See slides Nos. 7 and 8.)



SLIDE No. 7.—Corner room shelters.

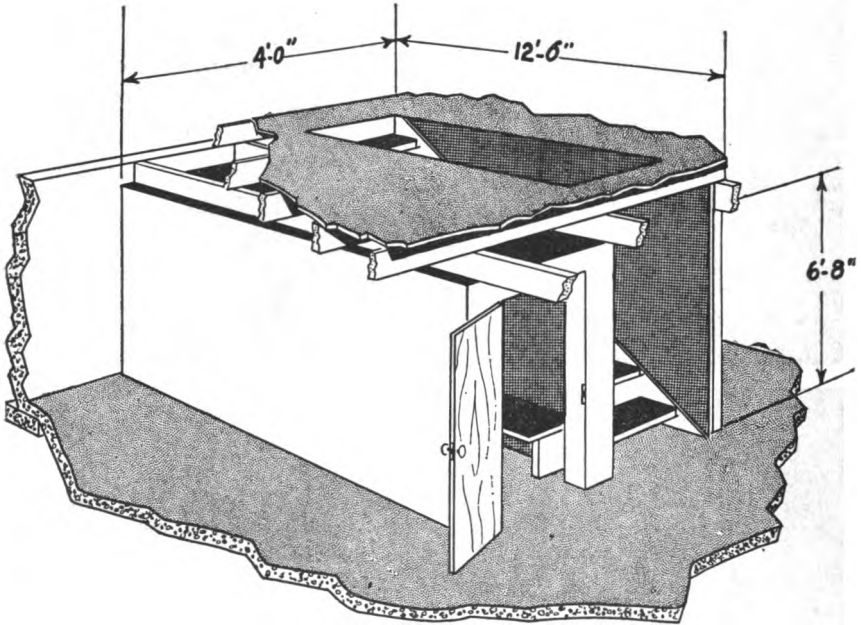


Slide No. 8.—Lean-to type shelters.

The houses in which the structures were located were not damaged so as to produce a large debris load on the basement shelters such as the lean-to type shelter.

A concrete room basement shelter which consisted of a long, narrow reinforced room next to a basement stairway was also tested. (See slide No. 9.) If persons had occupied any of the previously

SKETCH OF BASEMENT CONCRETE ROOM SHELTER



SLIDE No. 9.—Sketch of basement concrete room shelter.

described basement shelters in these tests, they would have survived.

Mr. HOLIFIELD. Now, you are speaking of the fact that they would have survived from the standpoint of blast. Do you include also radiological protection?

Mr. SAUNDERS. In these particular tests; yes.

Mr. HOLIFIELD. You do.

Mr. SAUNDERS. So far.

Mr. HOLIFIELD. Now the type of shelter displayed there is a concrete wall type or concrete-block wall type. Is it in a corner of a basement?

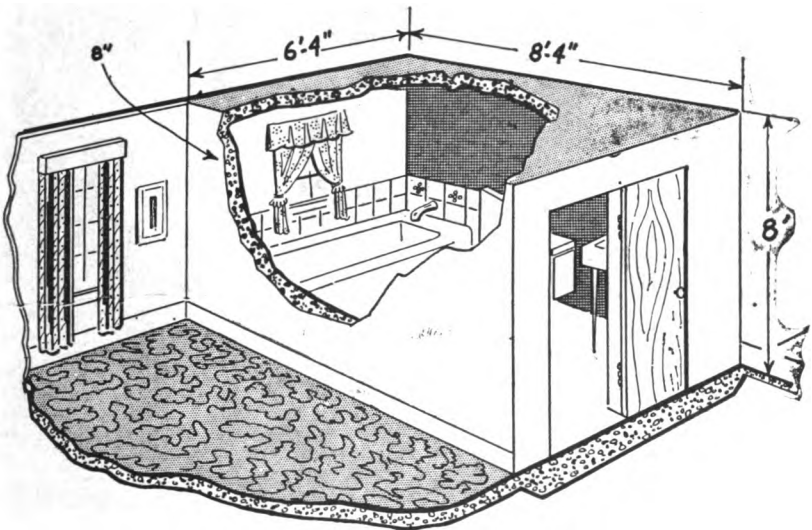
Mr. SAUNDERS. It is a reinforced concrete wall structure in the basement located next to the stair well as shown here. This is the way it was tested.

Mr. HOLIFIELD. That would be a comparatively inexpensive type of shelter, taking advantage of your basement location.

Mr. SAUNDERS. Yes, sir.

An increasing number of houses are constructed without basements. For such houses a reinforced concrete shelter built around the bathroom area of a typical frame rambler was designed to withstand 5 pounds per square in. (See slide No. 10.)

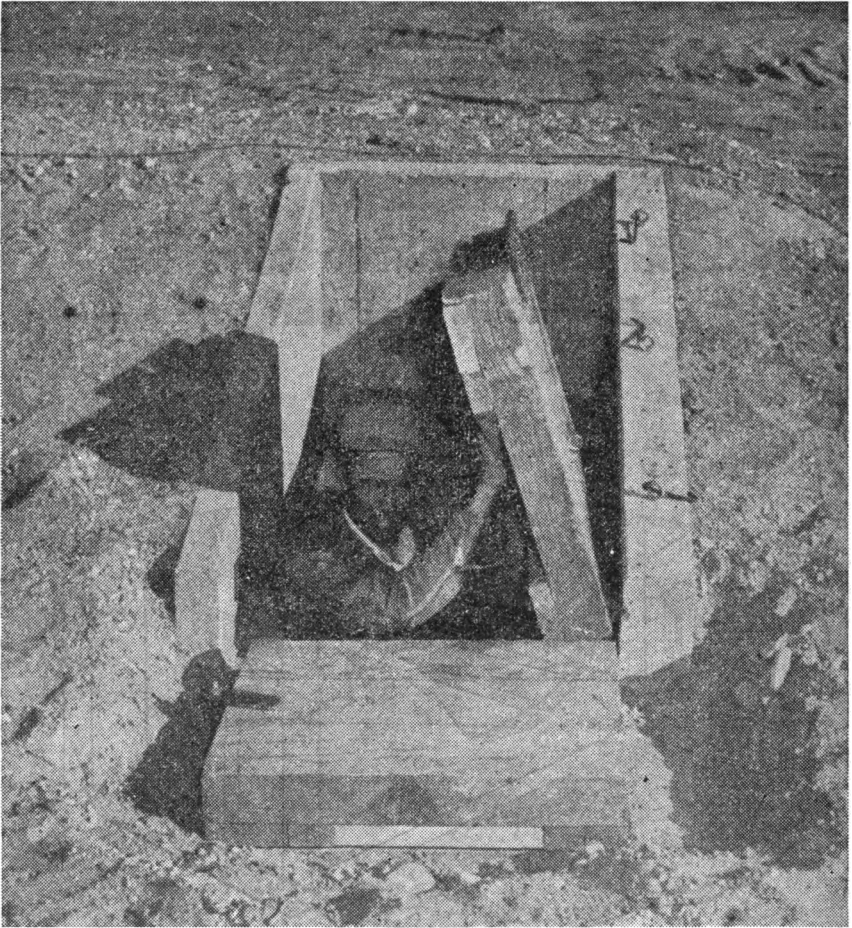
SKETCH OF REINFORCED CONCRETE BATHROOM SHELTER



SLIDE No. 10.—Sketch of reinforced concrete bathroom shelter.

The principles, of course, were applicable to any other room in the house. These shelters suffered little or no damage at 2 and 5 pounds per square inch and would have provided protection from blast and missiles.

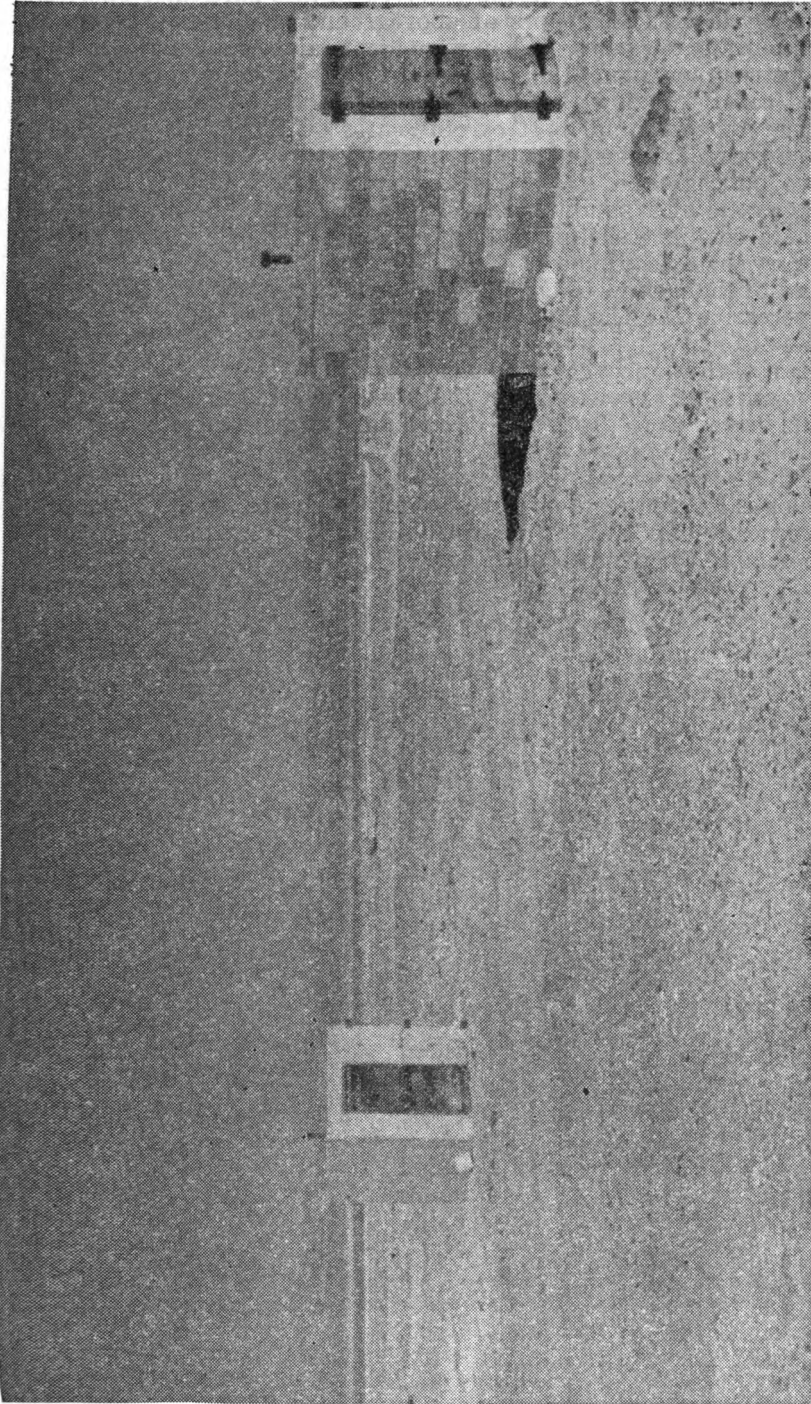
Family underground shelters tested in previous test series were not damaged. Therefore they were retested at higher load pressures in Operation Teapot which again was in 1955 to obtain response data desired. (See slide No. 11.)



SLIDE No. 11.—Family underground shelter.

Seven basement exit shelters were tested at pressures of approximately 15 to 45 pounds per square inch. Due to the severe damage in the entrance ways, the shelters would not have provided adequate protection.

FCDA also tested an aboveground dual-purpose family shelter which could be used for utility purposes during peacetime and as a shelter during periods of danger. (See slide No. 12.)



SLIDE No. 12.—Aboveground dual-purpose family shelter.

You will recall Mr. Wharton referred to this particular structure the other day. Three types of aboveground shelters were exposed at three pressure ranges. They were identical except for the method of construction—poured-in place reinforced concrete, precast reinforced concrete, and reinforced masonry block. The shelters were designed to withstand blast overpressures of 10 pounds per square inch and were undamaged at that pressure.

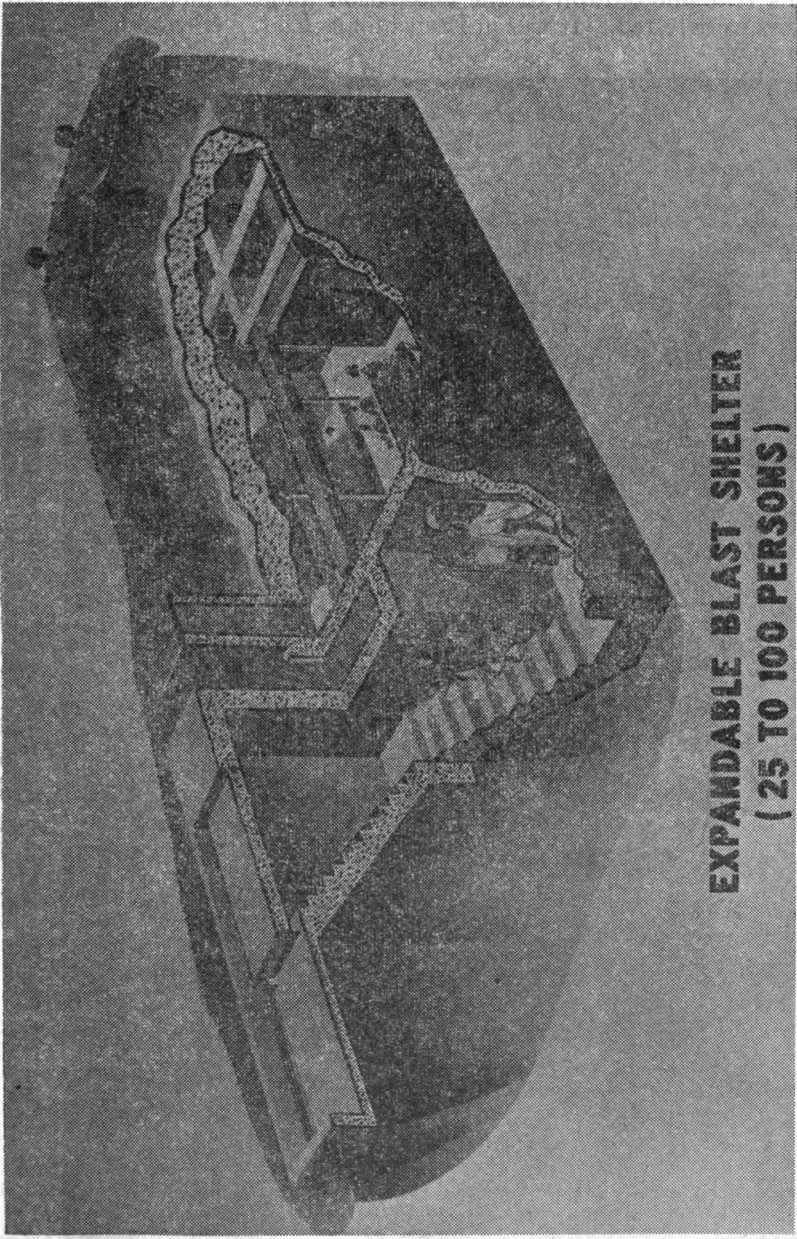
Two underground group shelters were placed within the heavy damage zone of a nominal-size nuclear weapon. This was the first test of a complete shelter including blast valves, air filters, and all necessary shelter equipment. (See slide No. 13.)

Each of the shelters tested was designed to accommodate 30 persons. By increasing the length, the shelter design is adaptable for 100 or more persons.

These shelters provide adequate protection from radiation, blast, and missiles at approximately 100 pounds per square inch.

This brings us to the recently concluded series; Operation Plumb-bob, held in the summer of 1957.

In this series emphasis was placed on tests of mass shelters and radiological defense. Four programs, which included 22 projects, were conducted by FCDA personnel or by our contractors to carry out these comprehensive technical tests.

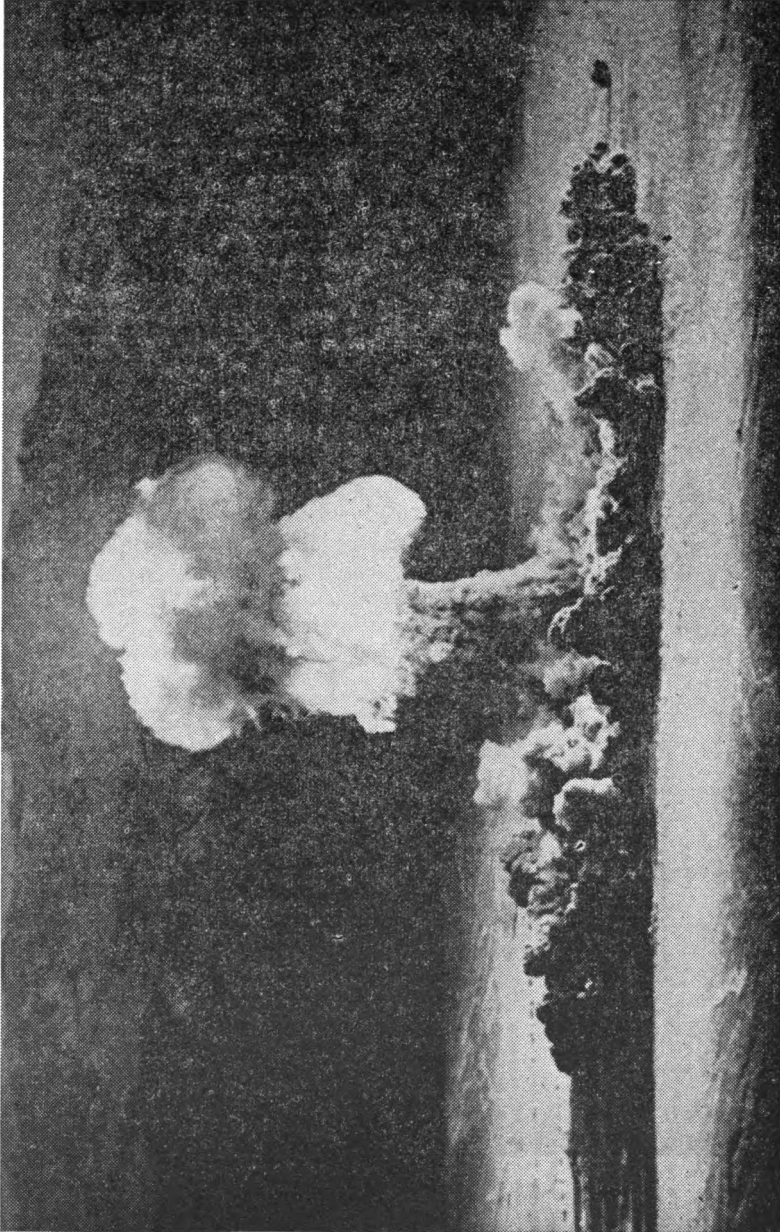


**EXPANDABLE BLAST SHELTER
(25 TO 100 PERSONS)**

SLIDE No. 13.—Expandable blast shelter (25 to 100 persons).

In addition, we were cosponsors with the Department of Defense, Atomic Energy Commission and the Food and Drug Administration on nine other projects.

This is a photograph of the detonation under which most of our shelters were tested. It was in Frenchmans Flat. (See slide No. 14.)



SLIDE No. 14.—Photograph of detonation under which most shelters were tested.

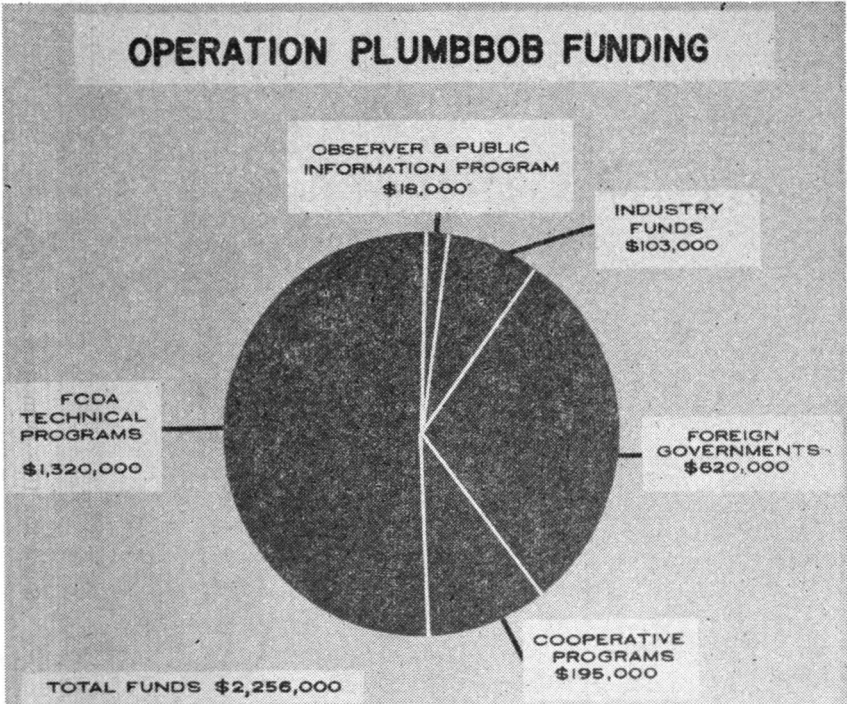
Mr. HOLIFIELD. What yield was this?

Mr. SAUNDERS. I think it is usually referred to as an above nominal. The actual yield has not been declassified.

Mr. HOLIFIELD. Nominal being 20 kilotons?

Mr. SAUNDERS. Yes, sir.

Instead of a single open shot for this program, the FCDA conducted observer programs for selected civil defense personnel and State and local officials in 10 of the shots of Operation Plumbob. Thirty-one foreign observers representing 10 nations also attended the program. In all over 250 persons witnessed the nuclear detonations.

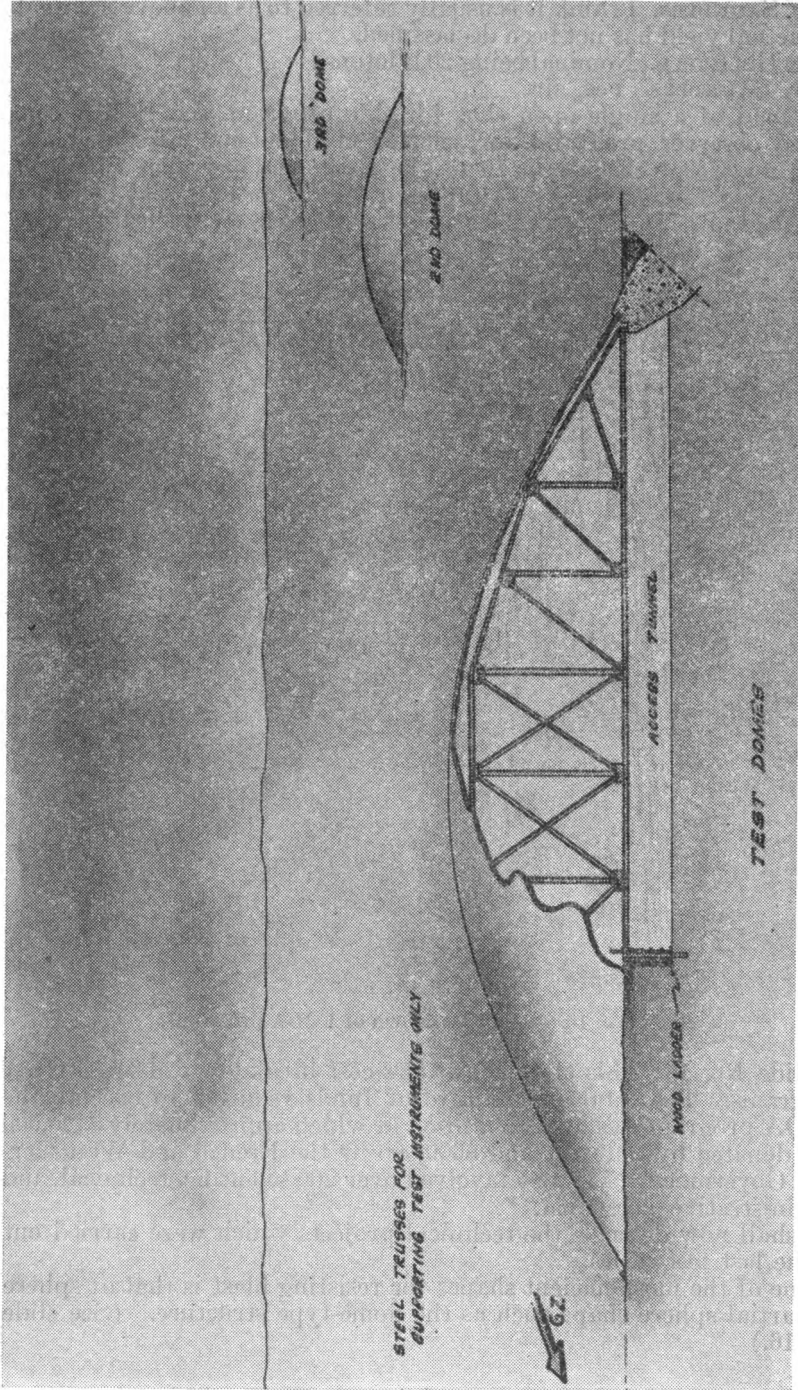


SLIDE No. 15.—Cost breakdown of FCDA programs.

Slide No. 15: This slide shows the cost breakdown of the FCDA programs. The total expenditure of funds required to execute the FCDA program was over \$2 million of which approximately \$100,000 was donated by industry and \$600,000 by the French and West German Governments. It also involved over 200 scientific, technical, and administrative personnel.

I shall now describe the technical projects which were carried out in the last test series.

One of the most efficient shapes for resisting blast is that of sphere or partial sphere shape such as the dome-type structure. (See slide No. 16.)



SLIDE No. 16.—Dome-type structure.

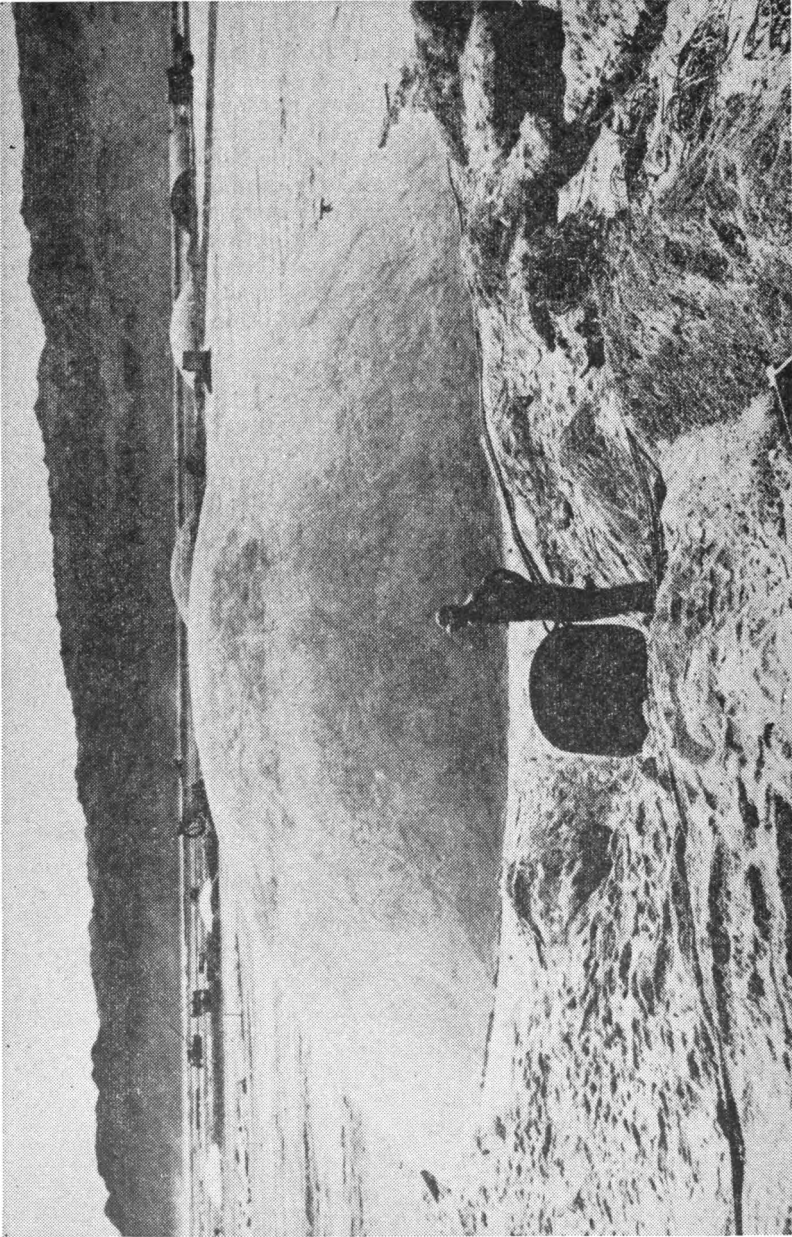
FCDA and the Department of Defense cooperated to obtain data on blast loading and structural response of dome-shaped structures.

FCDA tested three such structures which were 50 feet in diameter with walls consisting of 6 inches of reinforced concrete. There were no interior supports. (See slide No. 17) The structures were located at anticipated pressure ranges of 20, 35, and 70 pounds per square inch.

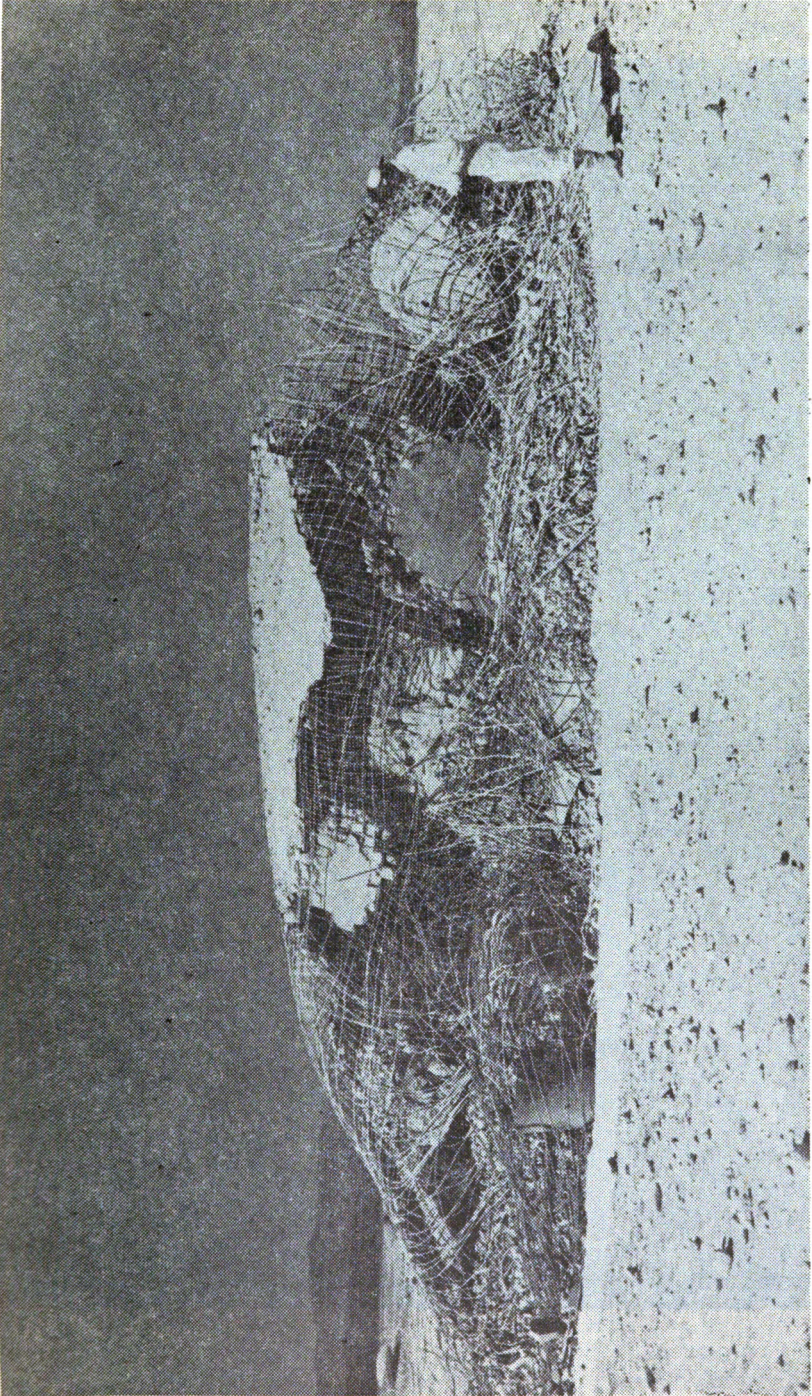
The blast caused no damage to the dome at 20 pounds per square inch, and appeared as shown in slide No. 17. The dome at 70 pounds per square inch was destroyed as is shown in slide No. 18, and the dome at 35 pounds per square inch was also badly damaged. The results obtained were as anticipated and verified our theoretical calculations.

Actually, the pressures went a little higher than we had anticipated. Designs and specifications for dome shelters are being developed based on data obtained from these tests of the pilot structures. To provide a clearer concept of the test dome, a model has been fabricated and is on display in the front part of the room.

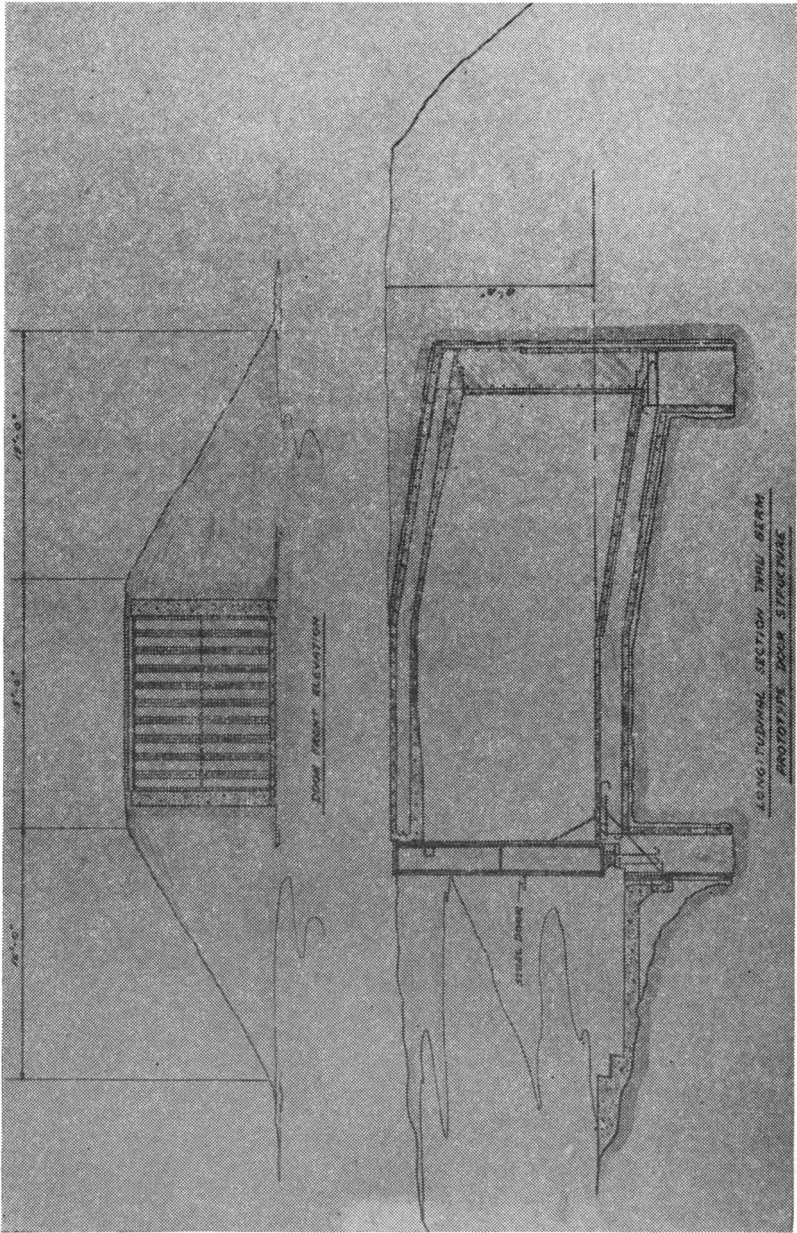
As an integral part of the group shelter, the door must be capable of allowing a large number of persons rapid access to a shelter and must provide a blast-resistant pressure seal. A steel door was designed and tested under the sponsorship of FCDA to determine its effectiveness in providing protection to occupants of a shelter. (See slides Nos. 19, 20, and 21.) The door is hinged at the bottom and drops down into



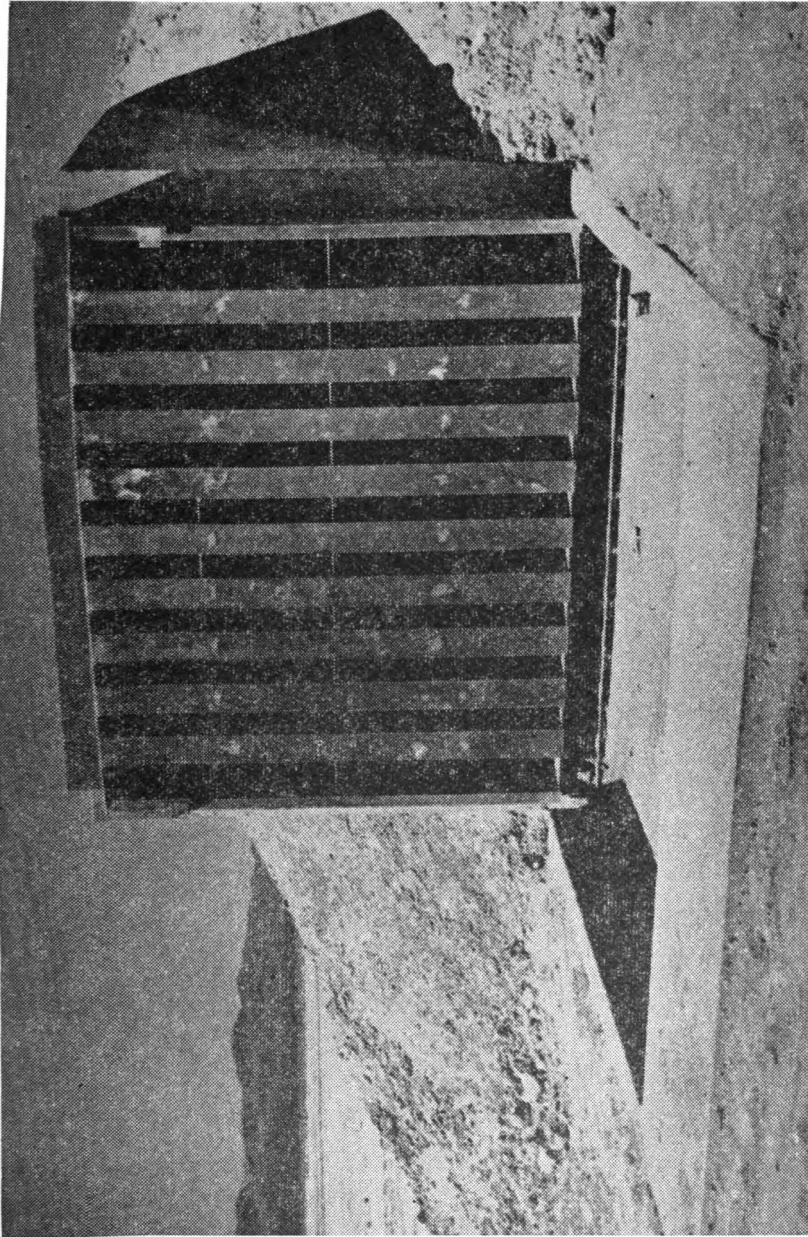
SLIDE No. 17.—Dome-type structure of the 20 pounds per square inch range.



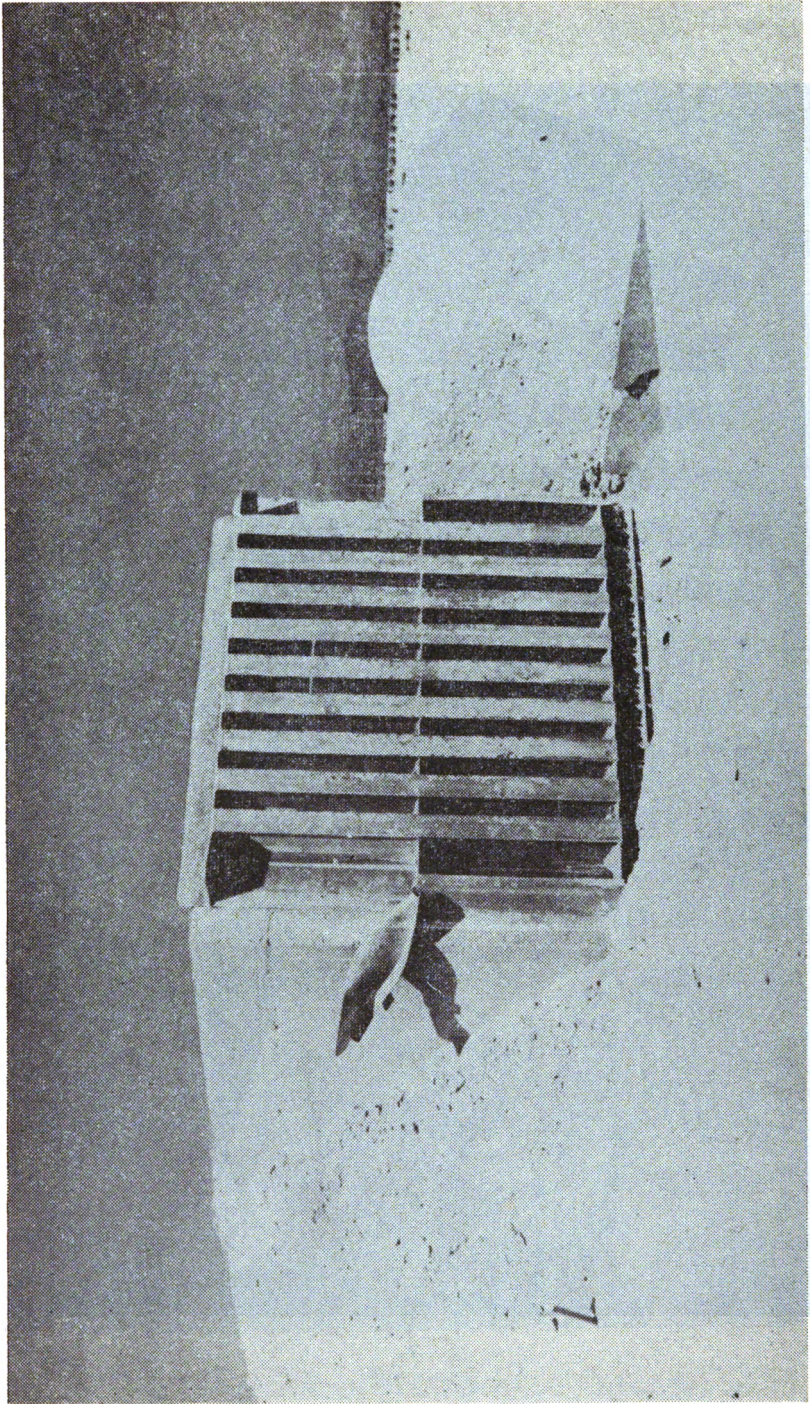
SLIDE No. 18.—Dome-type structure at the 70 pound per square inch range after the blast.



Slide No. 19.—Prototype door structure.



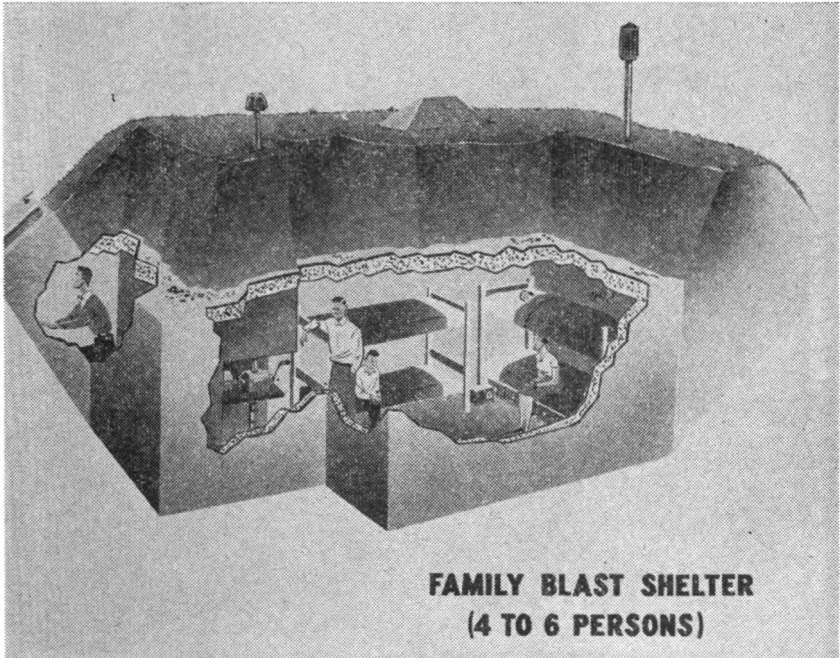
Slide No. 20.—Door hinged to bottom.



SLIDE No. 21.—Damaged door.

the pit shown. A scale model of this door is also on display. The door consisted of heavy sheet steel plate with reinforced steel beams welded on the front and was located at a pressure range of approximately 35 pounds per square inch. The extent of the damage was limited to the stripping of the upper outside flanges. Using the knowledge gained from this test, doors will be designed for use on group blast shelters.

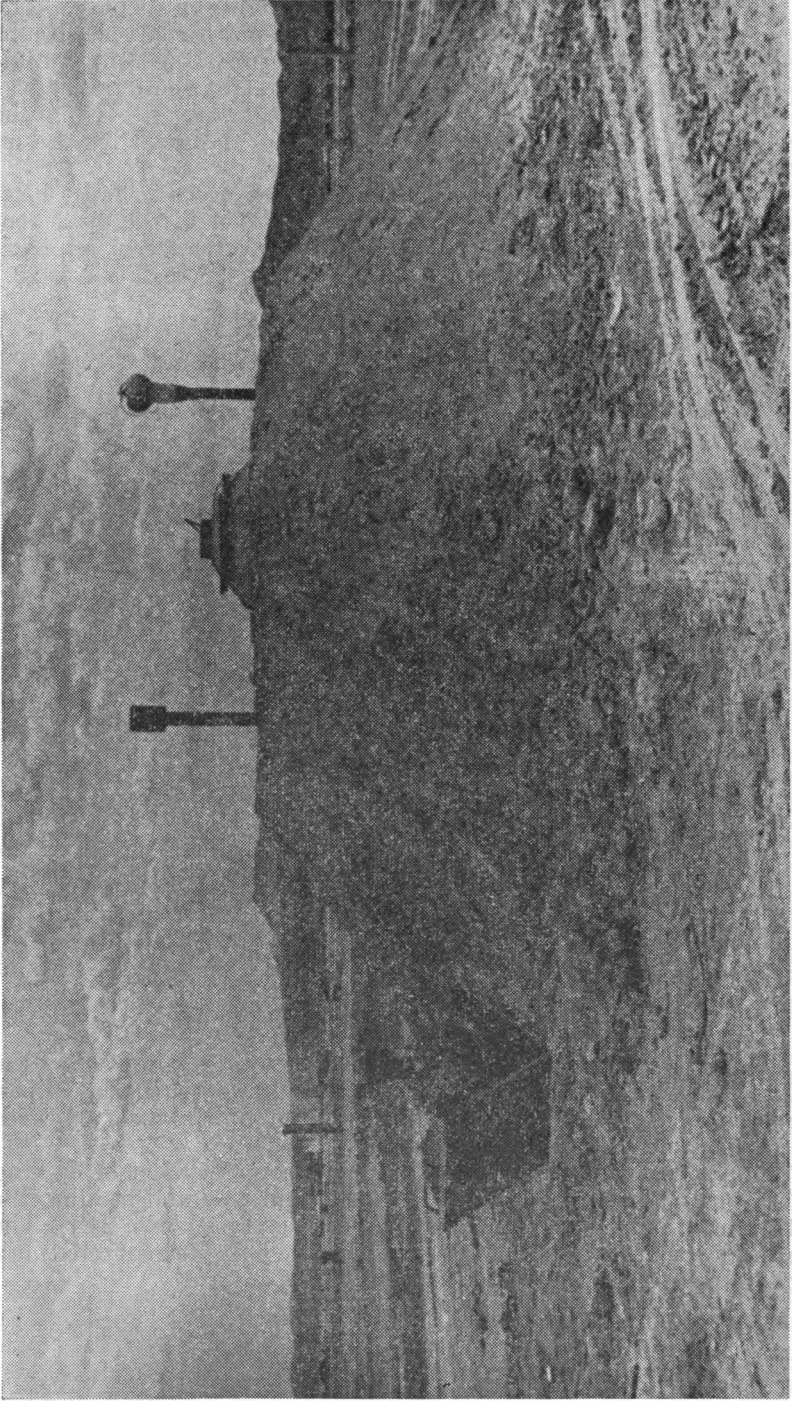
To determine the effectiveness of our most recent family-blast shelter designs and to collect data which might lead to a more economical design, we tested 3 identical shelters at a range of approximately 30, 50, and 70 pounds per square inch. (See slide No. 22.)



SLIDE No. 22.—Family blast shelter (4 to 6 persons).

Slide No. 23 is a view of the completed structure which shows the steel rectangular door, the main entrance and two ventilation pipes, a concrete block encasing an antenna, and an embankment of earth to provide protection from radiation.

The only damage suffered by these structures was that of dishing in the door of the shelter closest to the ground area and bending the ventilation pipes on all structures. (See illustration No. 24.) The information gathered in this test has already been incorporated in a new family-blast shelter bulletin.



SLIDE No. 23.—Completed structure which shows the steel rectangular door, the main entrance, and two ventilation pipes.

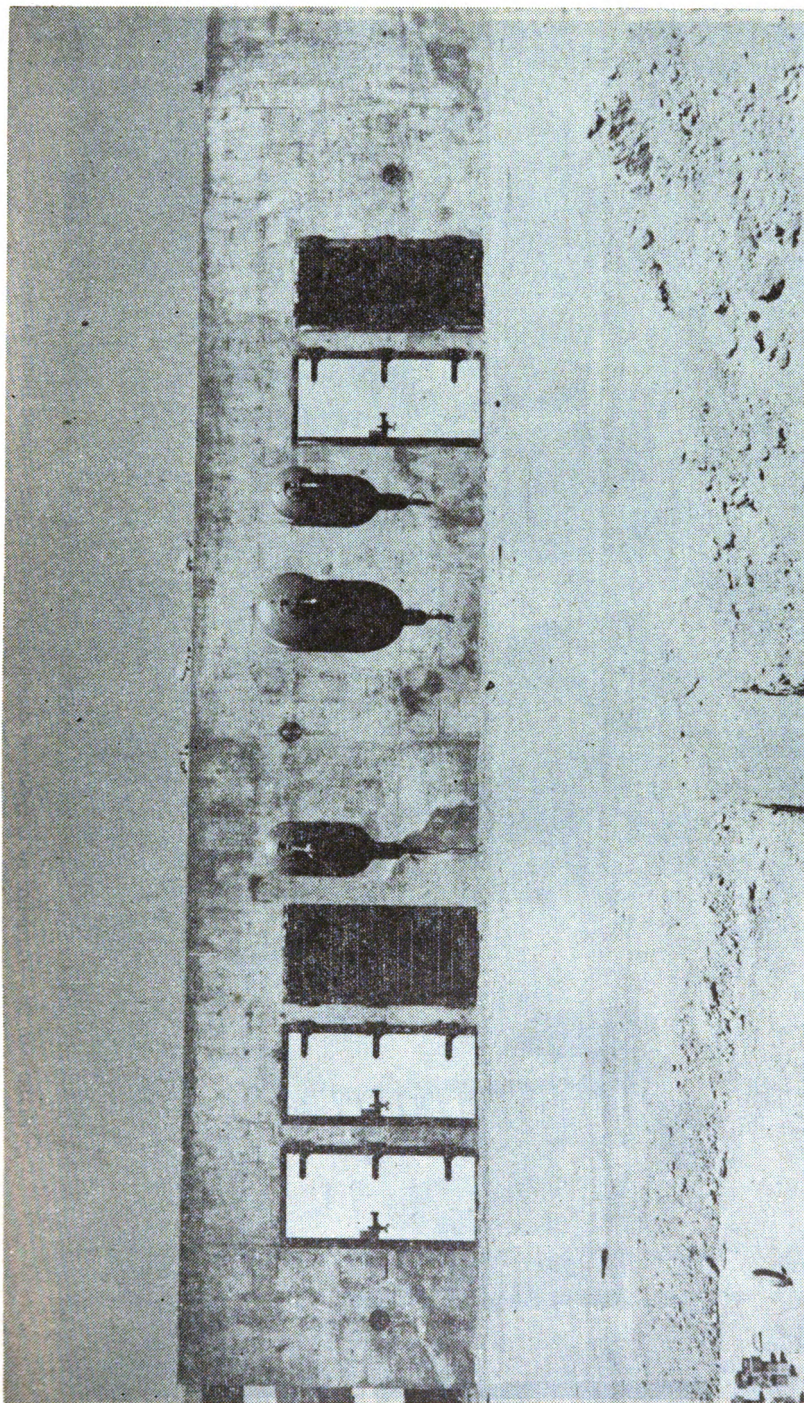


SLIDE No. 24.—Damage to structure.

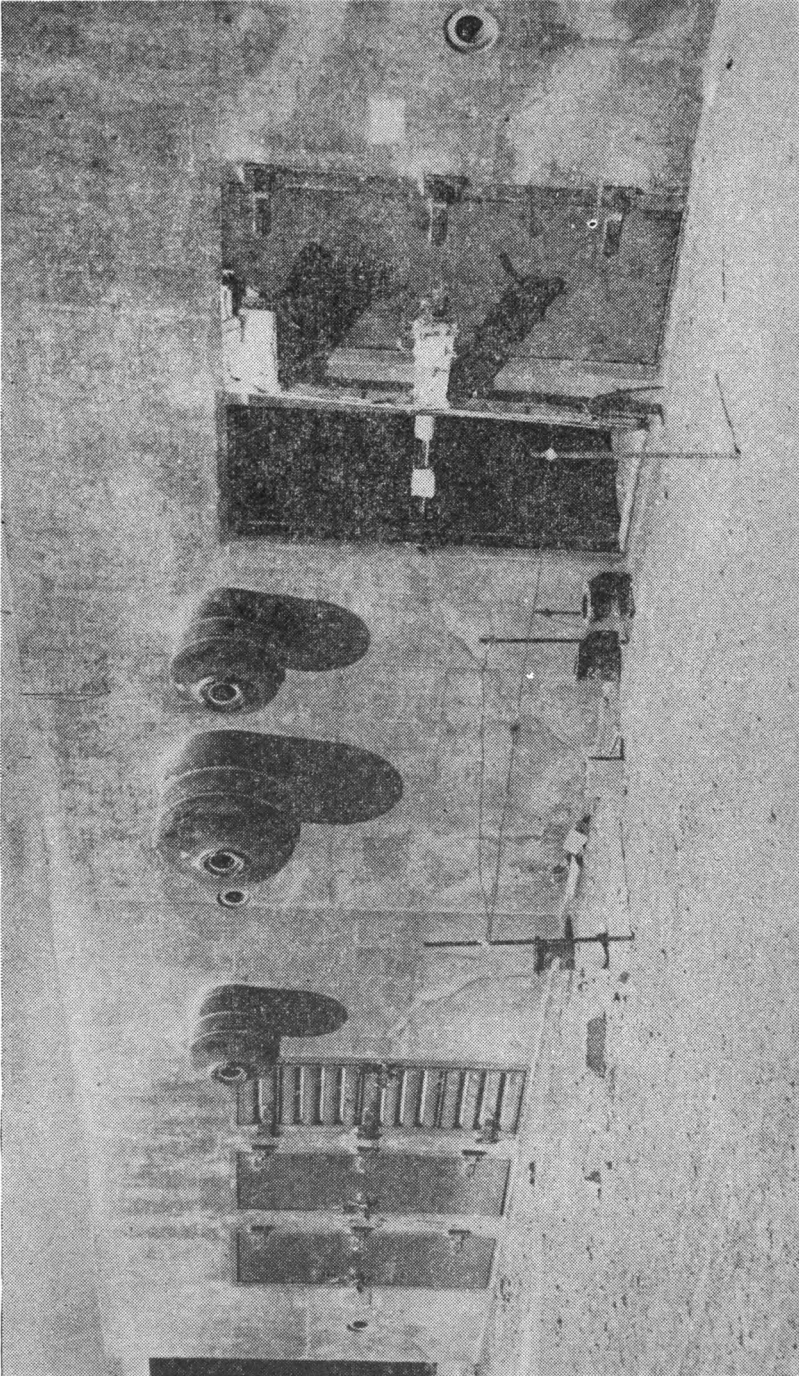
Past tests have shown that average commercially available doors become dislodged and fail to provide a pressure seal and create a missile hazard when exposed to low-blast pressures.

Five types of doors were designed for industrial and general use to provide protection on the periphery of potential target areas. The doors were tested at approximately $3\frac{1}{2}$ and 7 pounds per square inch. The types shown in slide No. 25 from left to right are solid plywood, wood plank, cellular steel, hollow plywood, and steel plate.

At the $3\frac{1}{2}$ pounds per square inch range, all of the doors satisfactorily withstood the blast and the damage was limited to scorching the paint. At the 7 pounds per square inch range, all doors stood up satisfactorily withstood the blast except for the hollow-plywood door which had been redesigned and strengthened. (See slide No. 26.)

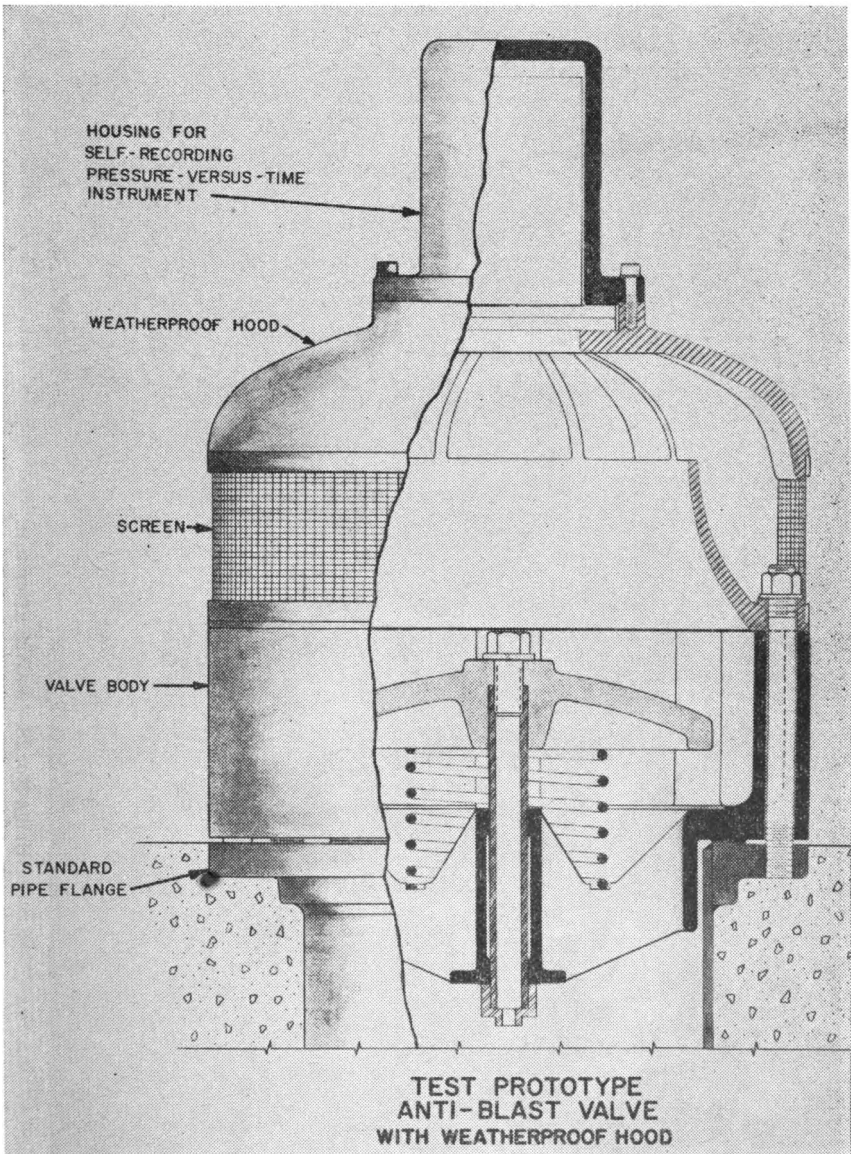


SLIDE No. 25.—Five types of doors designed for industrial and general use.



Slide No. 26.—Damage to 5 types of doors at 7 pounds per square inch range.

It was learned that general-purpose blast doors designed to resist medium overpressures could be made from solid wood, plywood, sheet steel, and cellular steel sections. The door design criteria will be distributed to architects and engineers interested in designing low-cost blast-resistant doors. (See slide No. 27.)

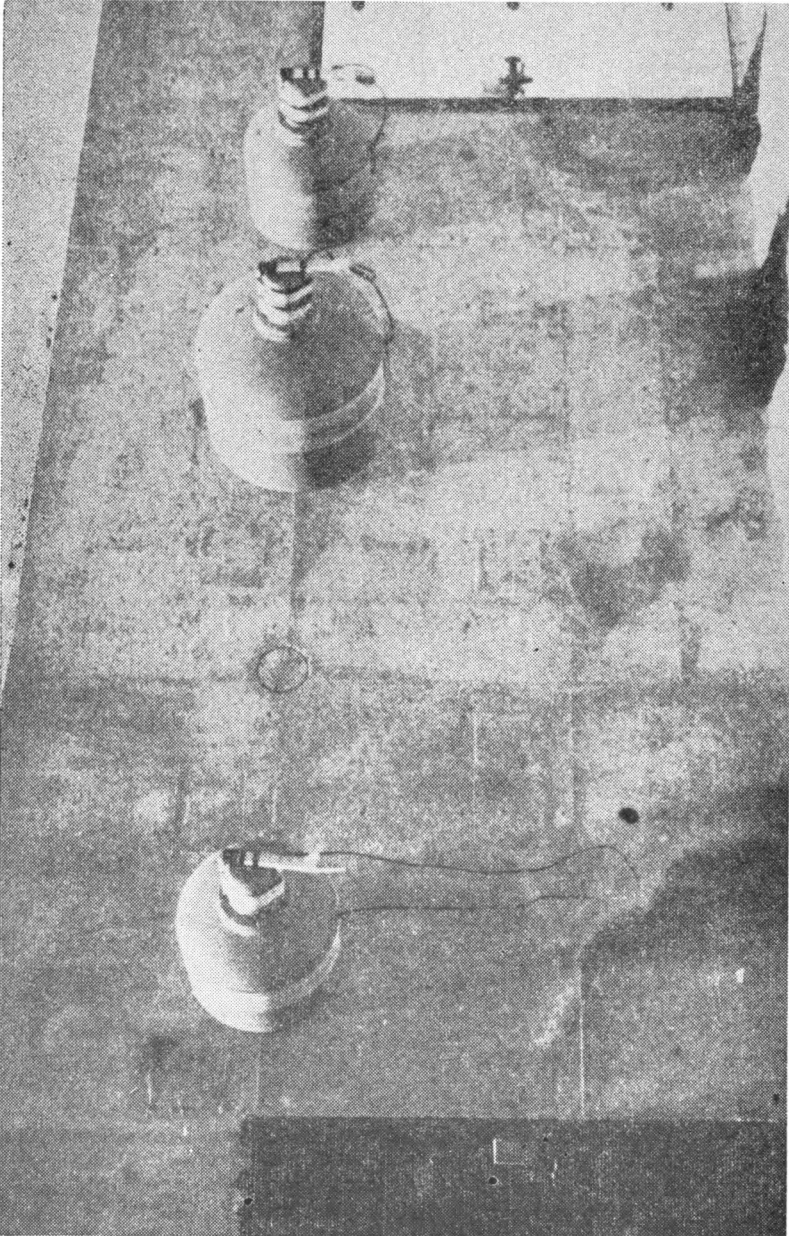


SLIDE No. 27.—Test prototype antiblast valve with weatherproof hood.

To limit the pressure rise and consequent damage to equipment and injury to occupants, ventilating openings in a blast-resistant structure must be closed before or within a few milliseconds after the arrival of shock wave. For this purpose 11 prototype antiblast valves

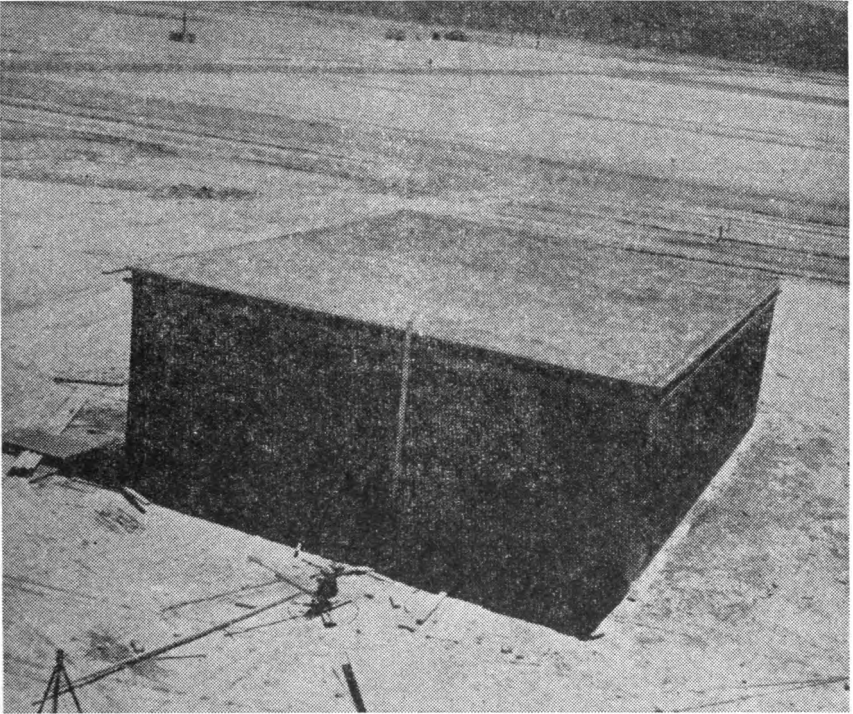
of various sizes were designed and tested. The valves were of the poppet type with the disk held in the open position by a spring and were actuated by blast overpressures.

The valves were tested at pressures from $3\frac{1}{2}$ to 100 pounds per square inch. (See slide No. 28.) Although the valves operated safely, some design refinements will be made to improve the performance and the series of sizes will be extended.



Slide No. 28.—Valves after test.

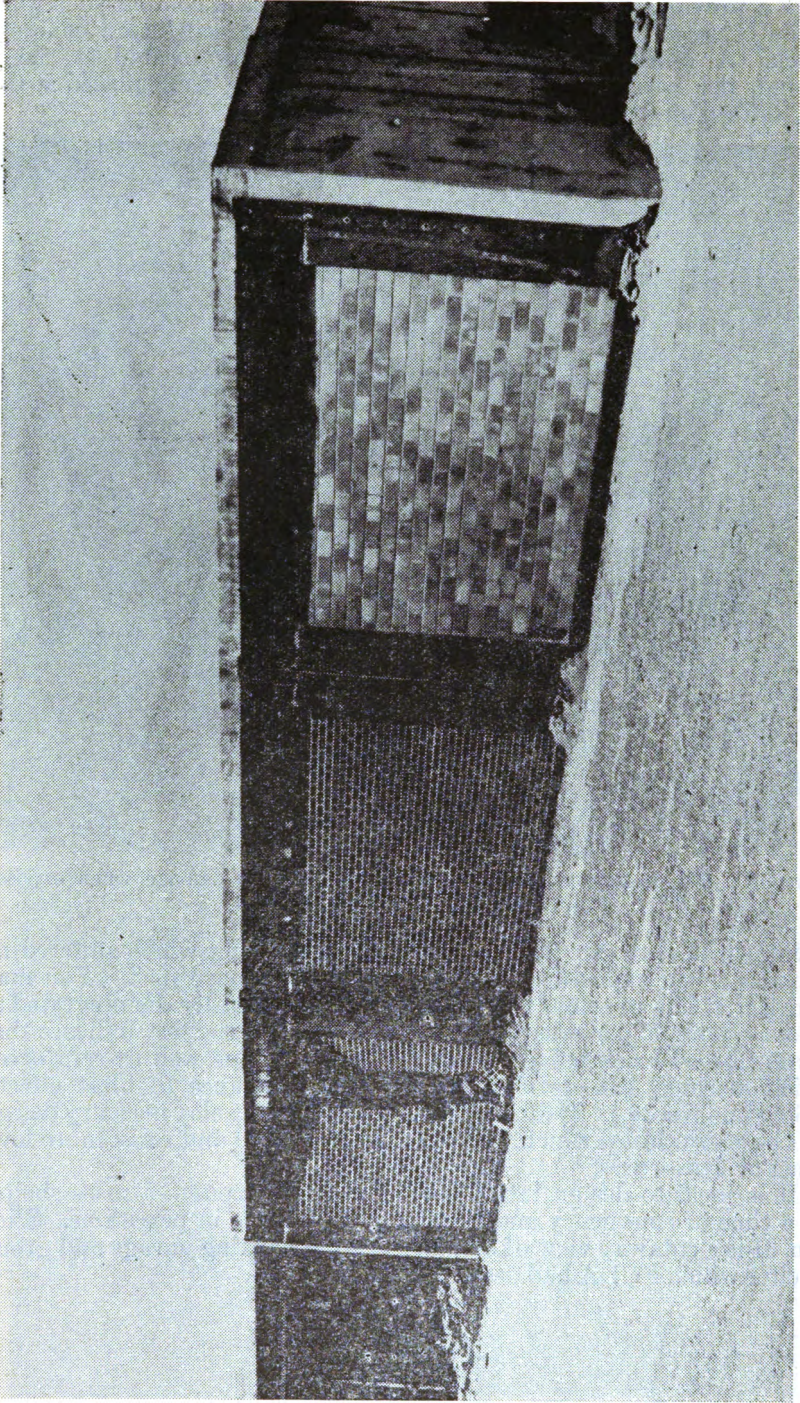
In a previous test series unfavorable and invalid comparisons were made between unreinforced brick masonry and reinforced concrete block. A reinforced brick windowless building located at the 5 pounds per square inch range, and 6 clay masonry wells placed at the 3½ and 7 pounds per square inch range were tested.



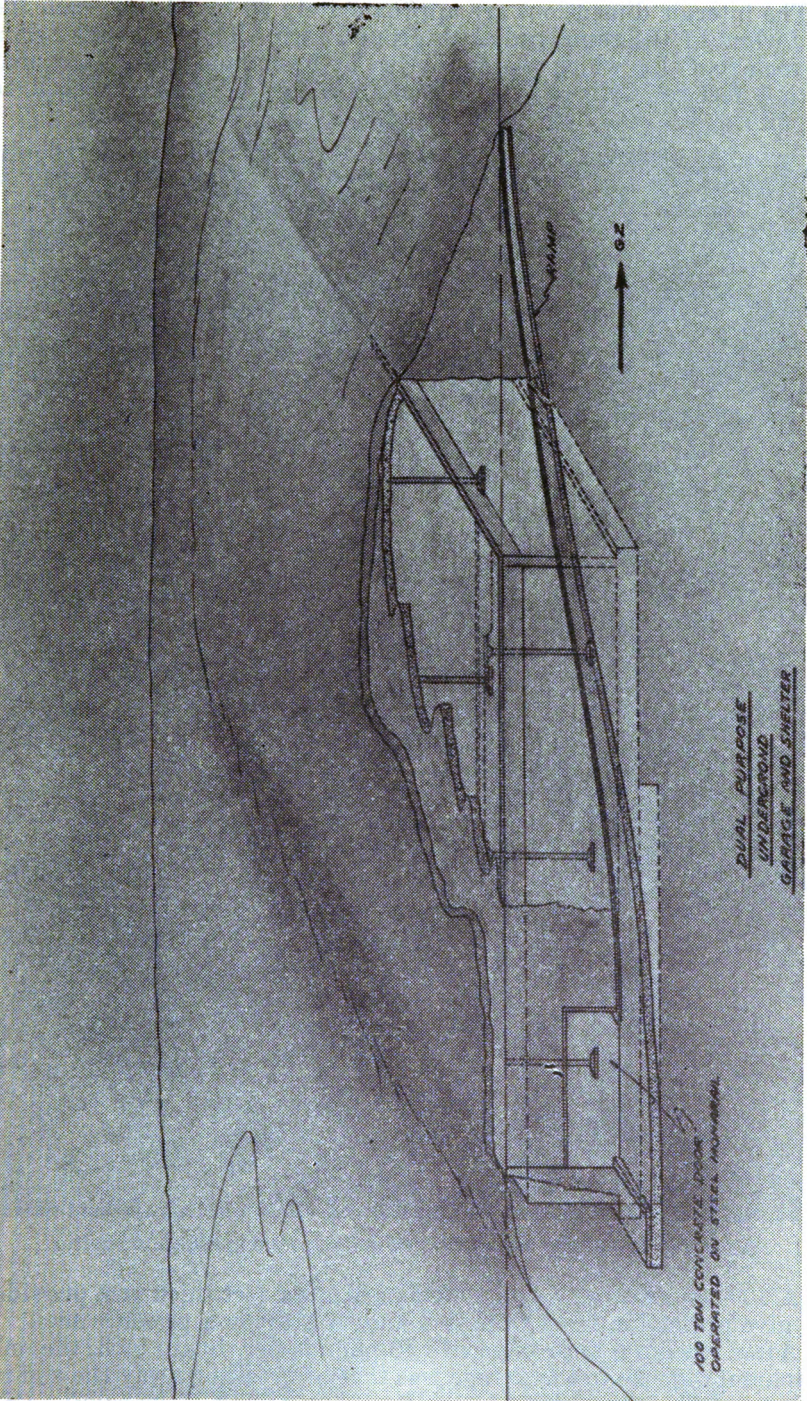
SLIDE No. 29.—Reinforced building which suffered no damage when exposed to over 5 pounds per square inch.

Shown in slide No. 29 is the reinforced building which suffered no damage when exposed to over 5 pounds per square inch. You may recall that in a previous test a brick structure literally disintegrated at about 5 pounds per square inch. The results of the test indicate that unreinforced brick using the arching principle as well as reinforced brick masonry can develop considerable resistance to blast effects. (See slide No. 30.) Using the results of the test, a clay masonry design has been developed which will be both economical and resistant to low-blast overpressures.

It is ideal to design into a shelter a dual purpose—a mass shelter in a time of emergency and a functional purpose in peacetime. Slide No. 31 is a cutaway view of an underground parking garage and group shelter which FCDA had designed and tested.

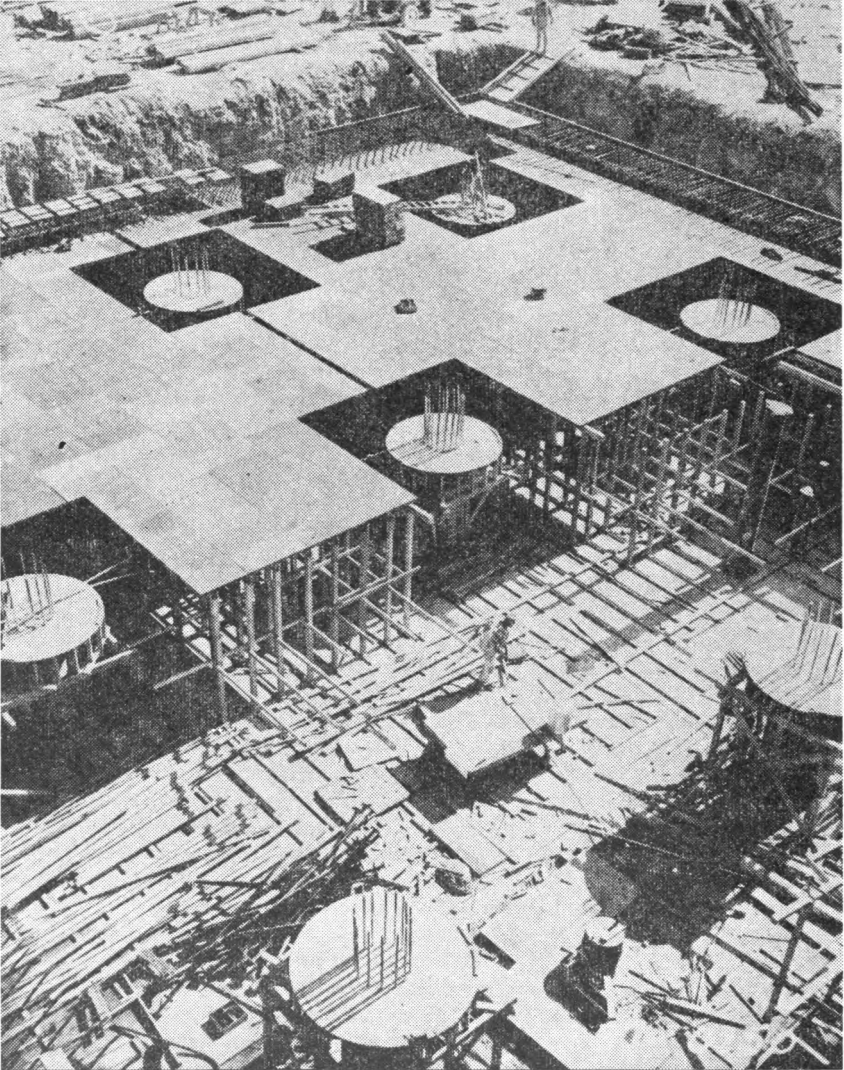


SLIDE No. 30.—Clay masonry walls designed to resist blast effects.



Slide No. 31.—Cutaway view of dual purpose underground garage and shelter.

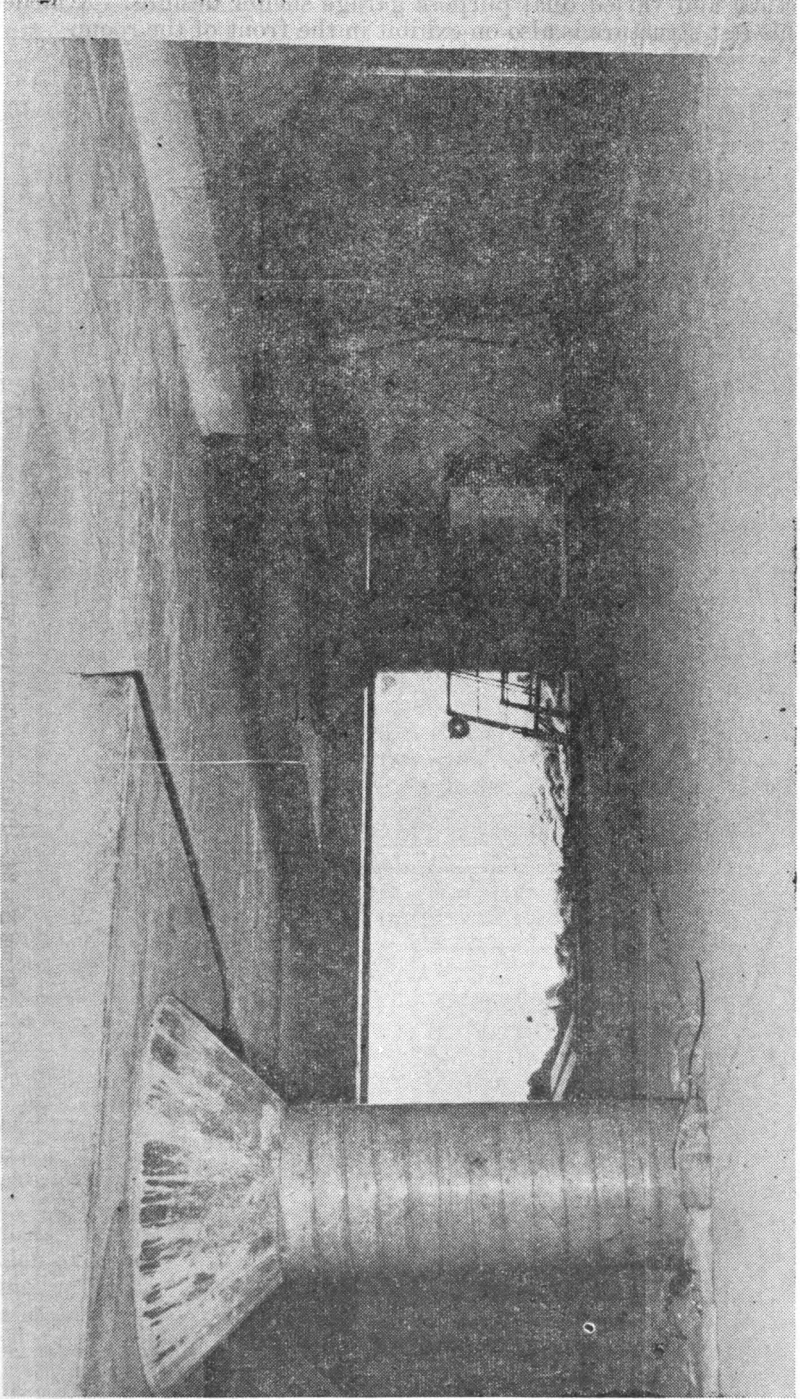
The interior dimensions are approximately 90 by 90 feet, with the centerline of the ramp radial to ground zero. The structure had a 30-inch roof slab which was supported by 9 columns and was covered with 3 feet of earth to attenuate the nuclear radiation. (See slide No. 32.)



SLIDE No. 32.—Construction view of underground garage and shelter.

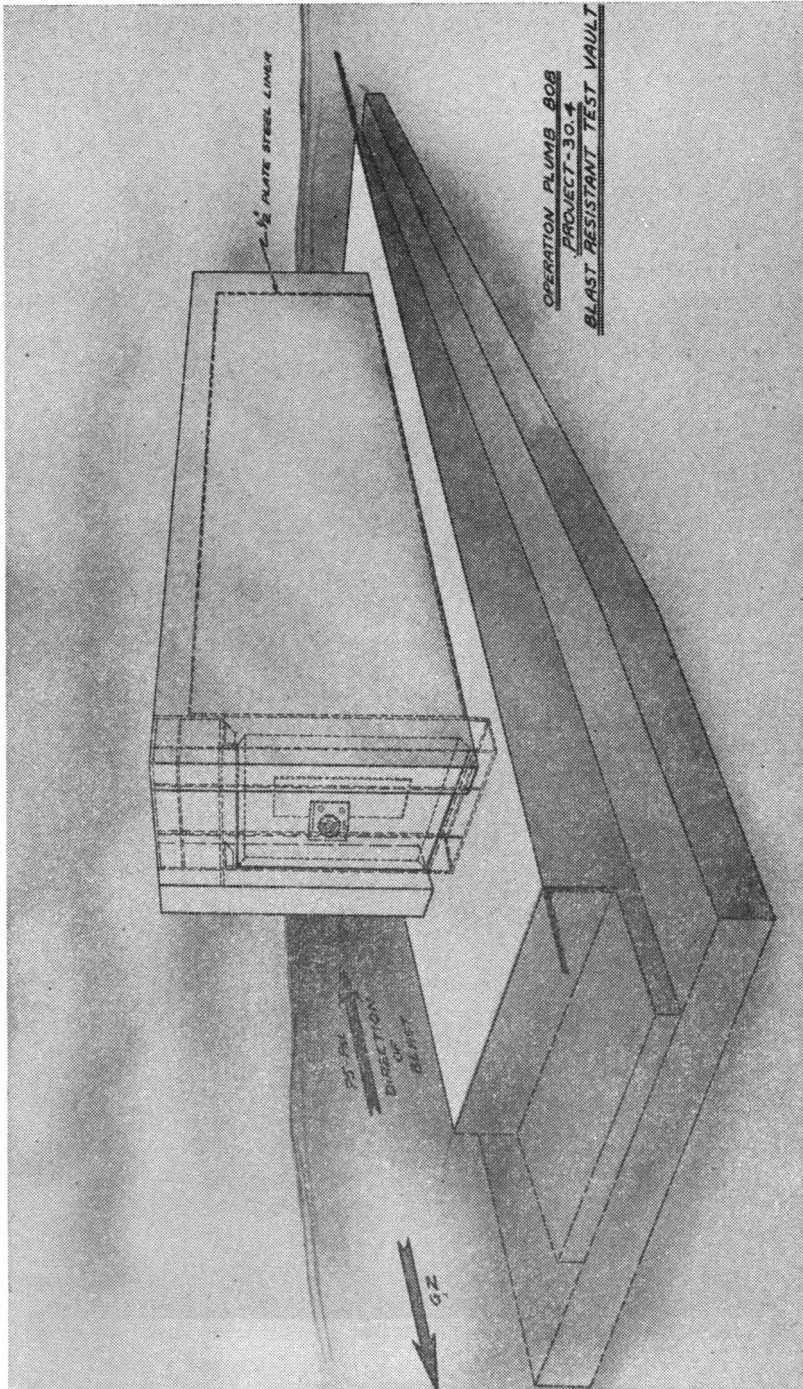
A 100-ton reinforced concrete door about 4 feet thick was provided to give protection from radiation and to provide a pressure seal.

After receiving approximately 40 pounds per square inch, the only apparent damage to the garage was that of breaking away the end retaining wall and cracking the side retaining wall of the ramp. (See slide No. 33.) The results indicate that occupants of the shelter would



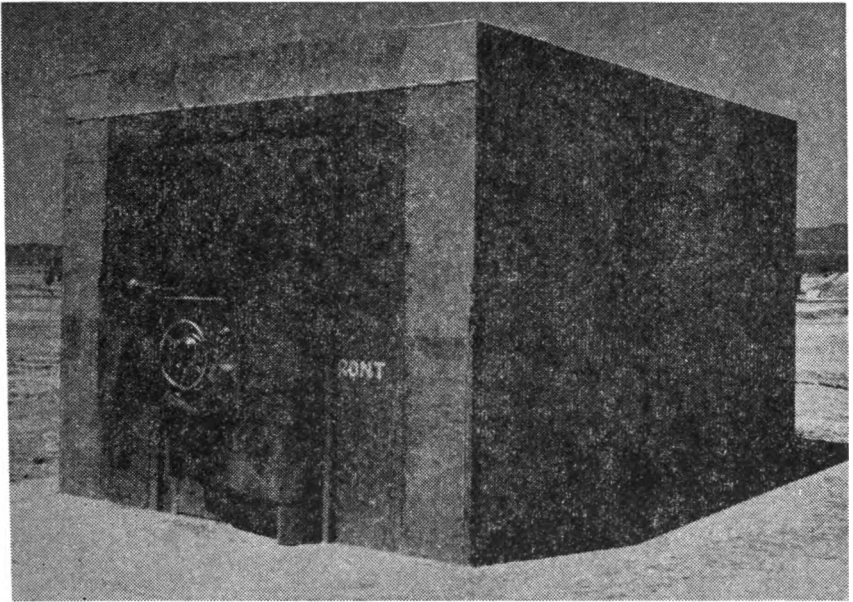
SLIDE No. 33.—Damage to garage.

have received good protection. This test has furnished the basis for practical and varied dual purpose garage shelter designs. A model of this test structure is also on exhibit in the front of the room.



SLIDE No. 34.—Blast resistant test vault.

In a project financed by industry, we tested a steel-lined reinforced concrete vault, using a standard steel vault door modified to resist high blast overpressures. (See slide No. 34.) Slide No. 35 is the completed



SLIDE No. 35.—Completed test vault.

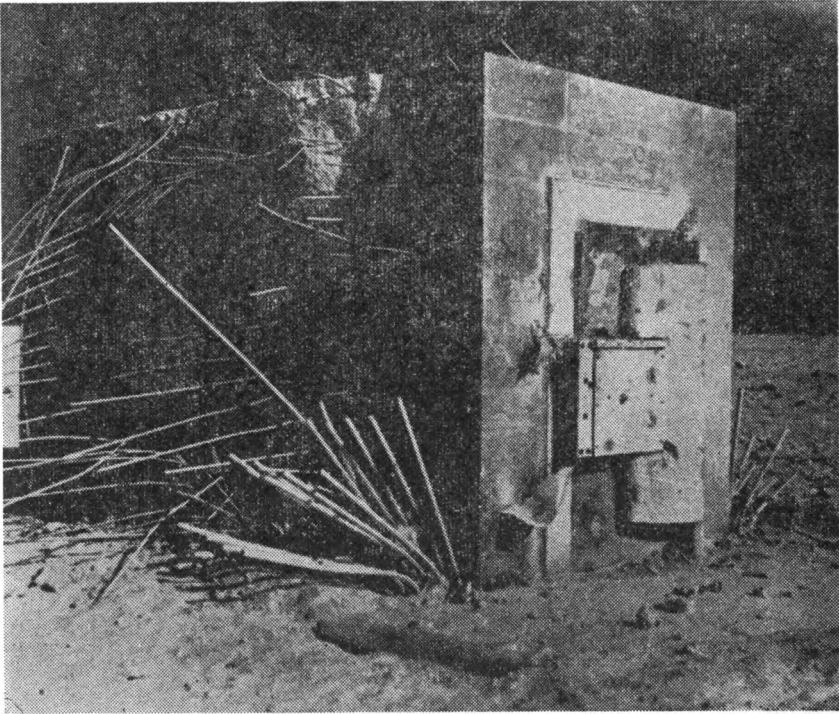
structure showing the 7-ton steel door, 14-ton steel frame of the door, and 18 inches of reinforced concrete covering the steel liner. The structure was located at the 90 pounds per square inch range.

Mr. HOLIFIELD. How much?

Mr. SAUNDERS. About 90 pounds per square inch. The damage suffered by the structure was that of stripping off part of the reinforced concrete sides and breaking off the hardware required to open the door. Even though the damage appeared to be quite heavy in slide No. 36, there was no apparent pressure or temperature increase within the vault. Therefore, documents and money in the vault would have been satisfactorily protected. When the combination was reset, the 7-ton steel door was easily opened.

Mr. HOLIFIELD. In looking at these structures, the question which occurs to me is why there was no attempt made to take advantage of curving and slanting surfaces rather than flat surfaces. Was it because you were trying to reproduce conventional lines of architecture?

Mr. SAUNDERS. Well, I think that most of our shelter structure tests were below ground, that is in the 1957 test series, with the exception of the dome, and, of course, it did have a curved surface and with mounding of earth it would flatten out the slope even more to present a streamlined effect.



SLIDE No. 36.—Damage to vault after blast.

Mr. HOLIFIELD. That is what I was addressing my remarks to. That last structure, for instance, a square box sitting out there on the sand, if it had been slightly arched or the corners rounded, I am wondering what the blast effects would have been in relation to a completely conventional-type room.

Mr. SAUNDERS. This was an industry structure and it was supposed to be a test of a typical vault which you would find in a bank.

Mr. HOLIFIELD. I see.

Mr. SAUNDERS. This is the purpose for that type of structure. It was sponsored by the Mosler Safe Co.

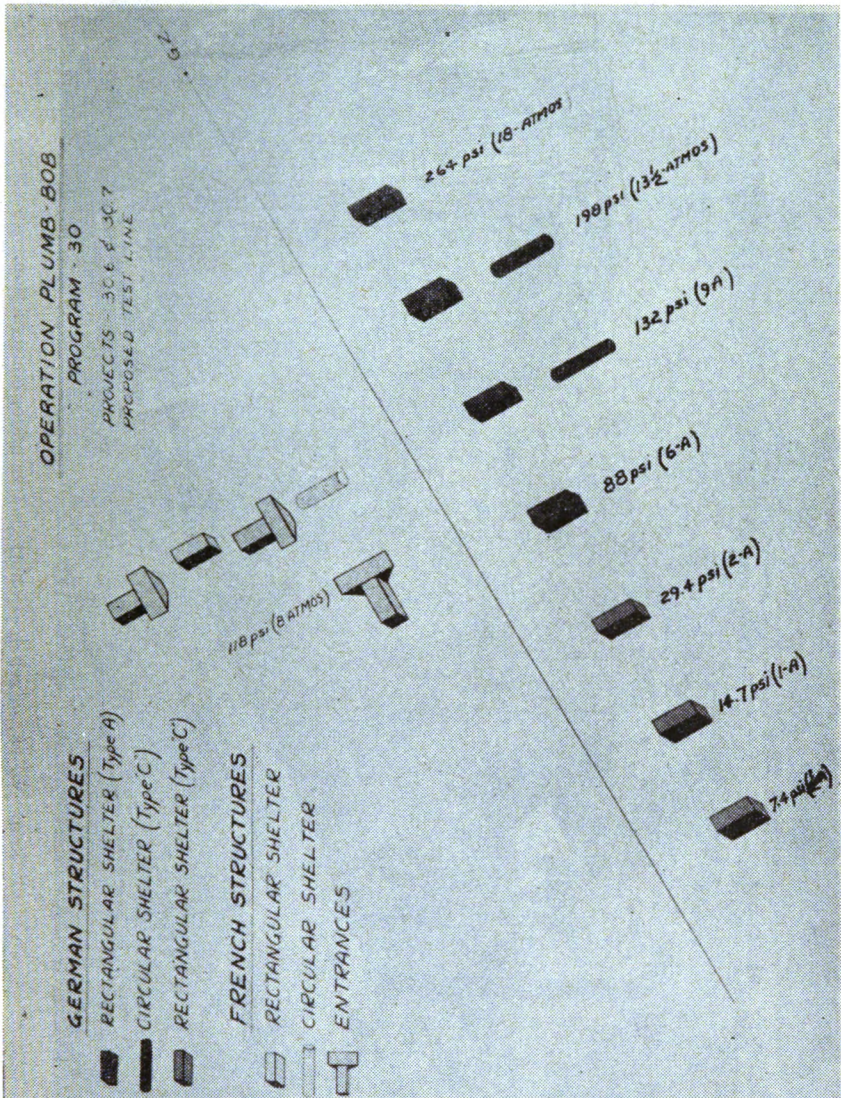
Mr. HOLIFIELD. I see.

Mr. SAUNDERS. A slight design modification would probably have eliminated the stripping off of the sides as it did.

Mr. HOLIFIELD. Design of the vault, you mean?

Mr. SAUNDERS. No, design of the frame on the front of the building. If they had brought the frame around the front so the pressure would not have gotten into this crack and there definitely was a crack which was established by the photography, the walls would not have been stripped off as they were.

As I mentioned earlier, FCDA sponsored the French and West German shelters tested at the expense of the respective Governments to obtain design criteria and make design improvements. Five French and 9 West German structures were tested at predicted pressure locations as shown in slide No. 37. The French structures were located



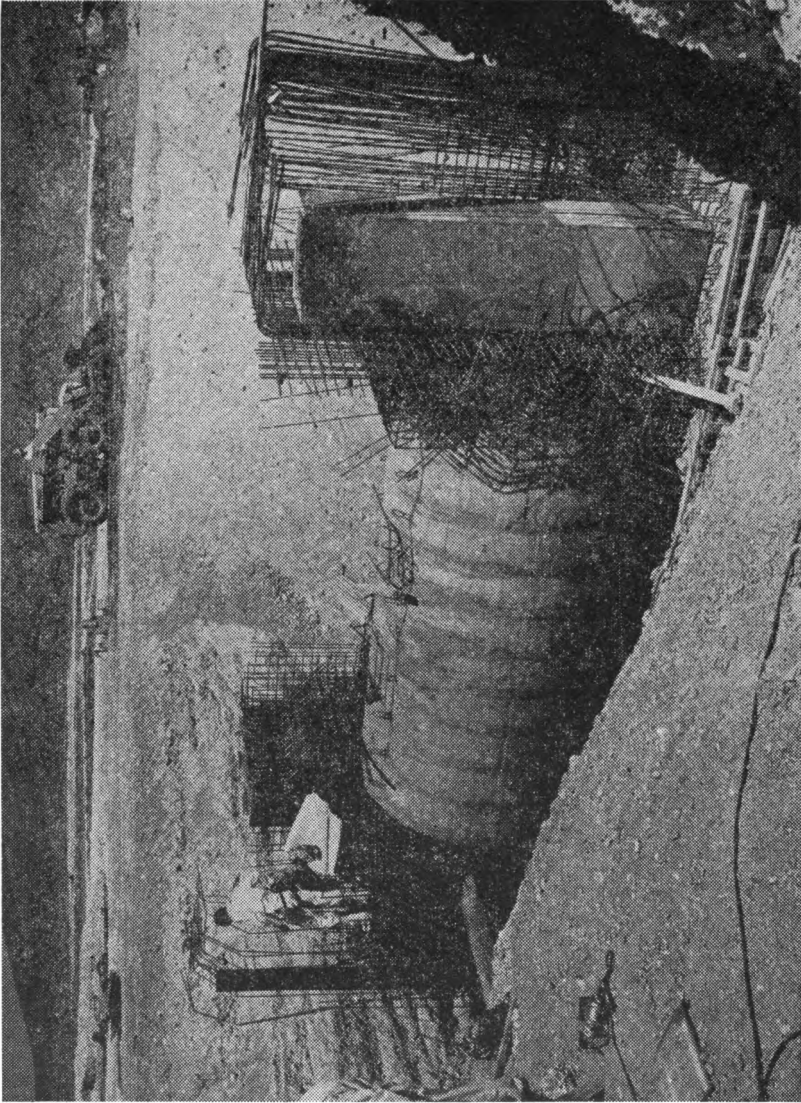
SLIDE No. 37.—German and French structure locations.

as follows: 1 rectangular shelter, 1 circular shelter, and 2 entrance ways at 132 pounds per square inch—these are predicted pressures, and 1 entranceway at 118 pounds per square inch.

The West German shelters tested were: 7 rectangular structures located at predicted pressures of 7 to 265 pounds per square inch range, and the 2 circular shelters at the 132 and 198 pounds per square inch range.

All of the foreign structures were constructed of heavily reinforced concrete. Foreign supplied doors, ventilation equipment, and reinforcing bars were tested as component parts of the shelter.

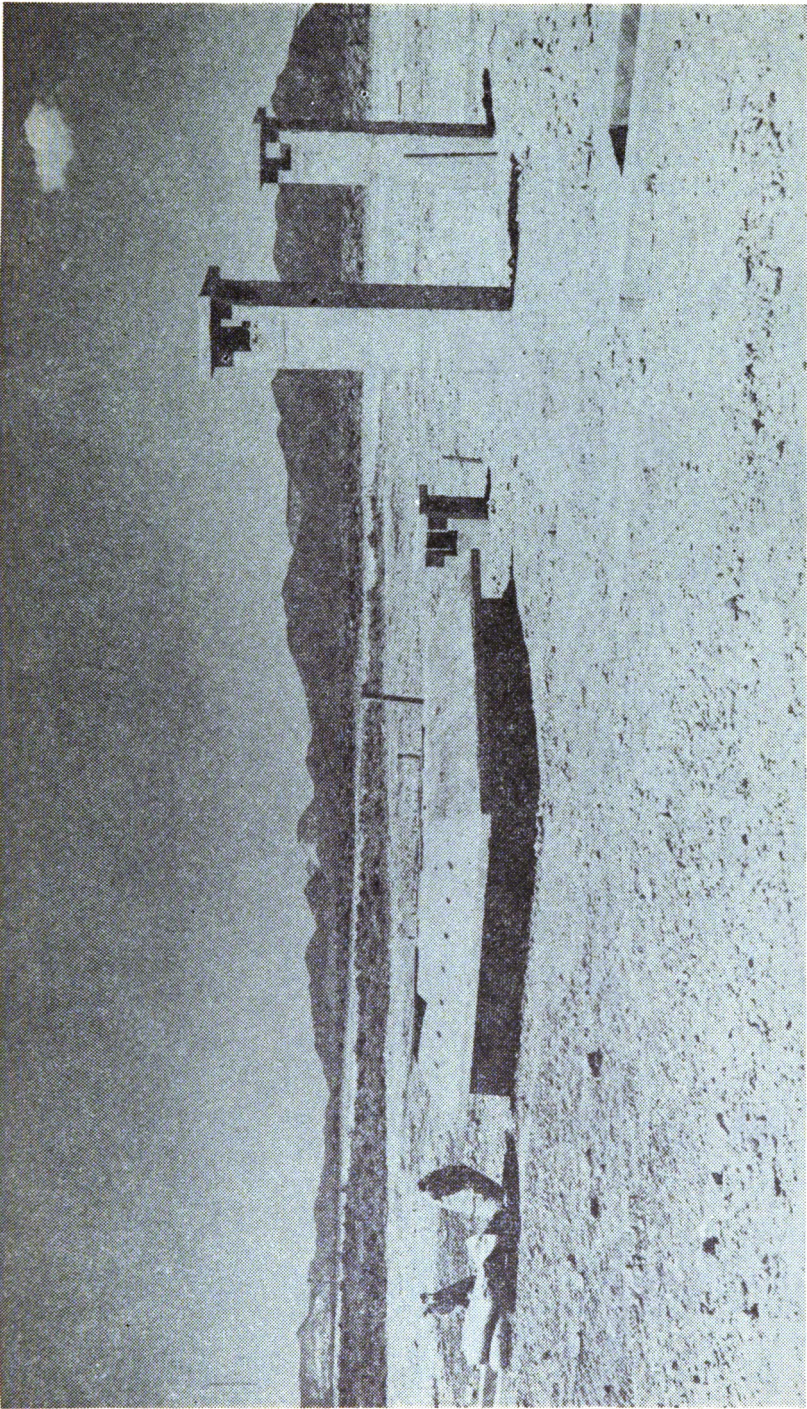
(See slide No. 38.) Shown here is the French circular shelter under construction. Slide No. 39 is the completed French rectangular



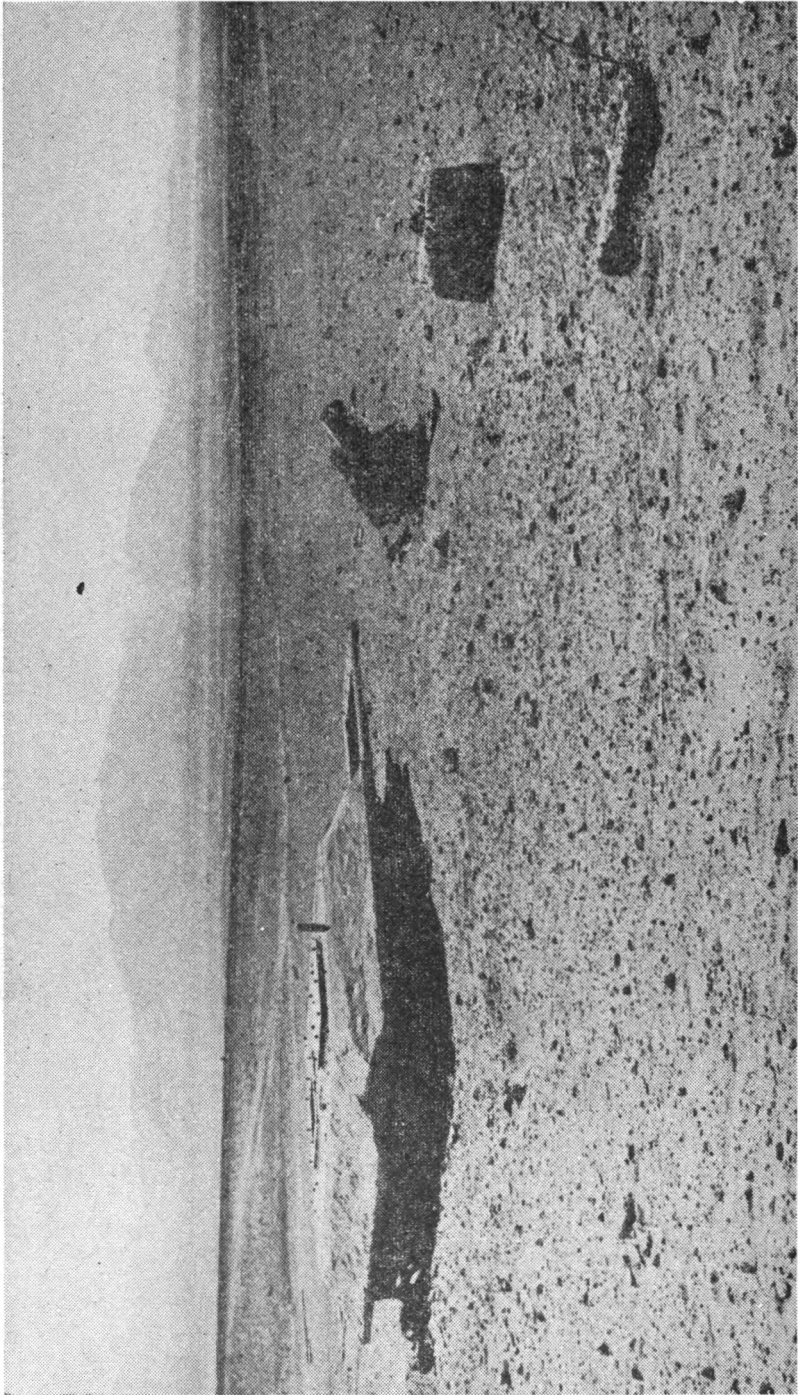
Slide No. 38.—French circular shelter under construction.

underground shelter. The entrances to the shelter are shown on either side of the picture. The air-filtering system is in the center; the tall exhaust stacks are on the left. These structures received slightly less than the 132 pounds per square inch anticipated. The major damage consisted of the destruction of some of the above ground accessories.

Slide No. 39 is a preshot view of the French rectangular shelter. Slide No. 40 is a postshot view of the same structure.



SLIDE No. 89.—Preshot view of French rectangular shelter.



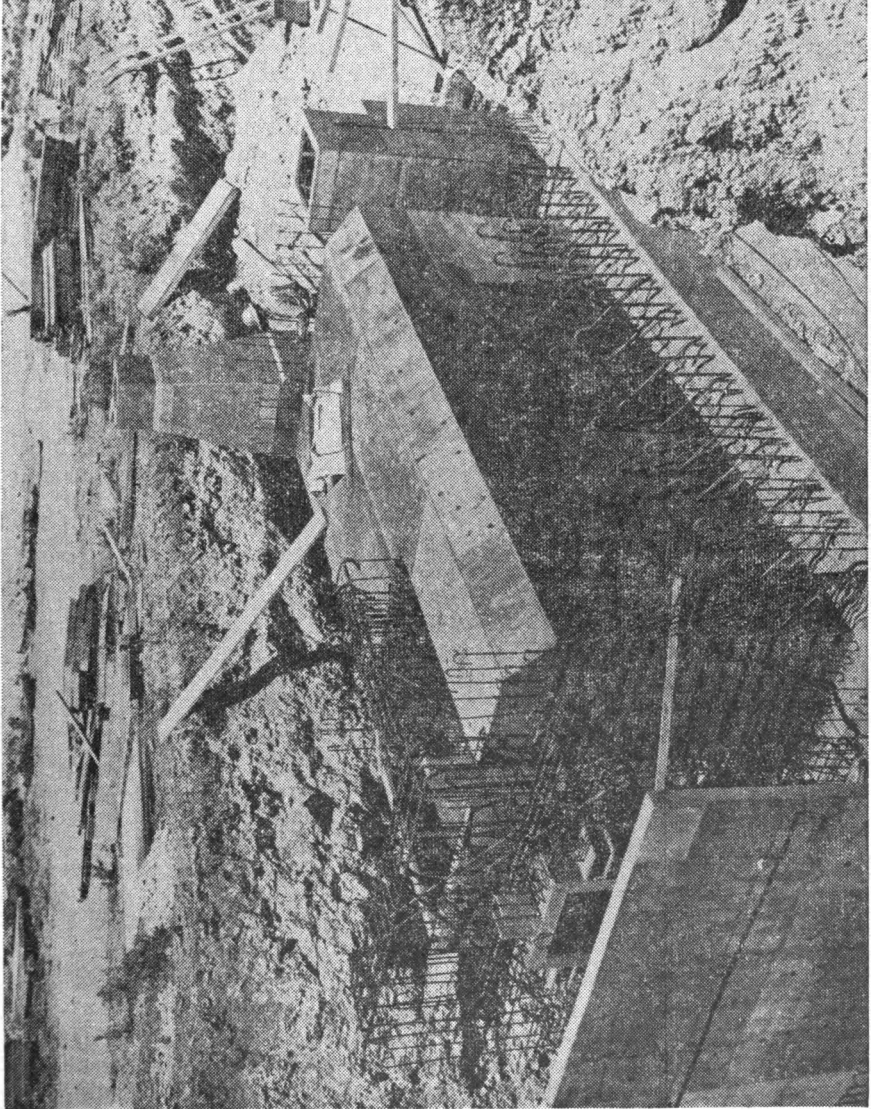
Slide No. 40.—Postshot view of French rectangular shelter.

Mr. HOLIFIELD. The tall towers were blown down ?

Mr. SAUNDERS. Yes, and some of the towers were located as much as 200 and 300 feet away.

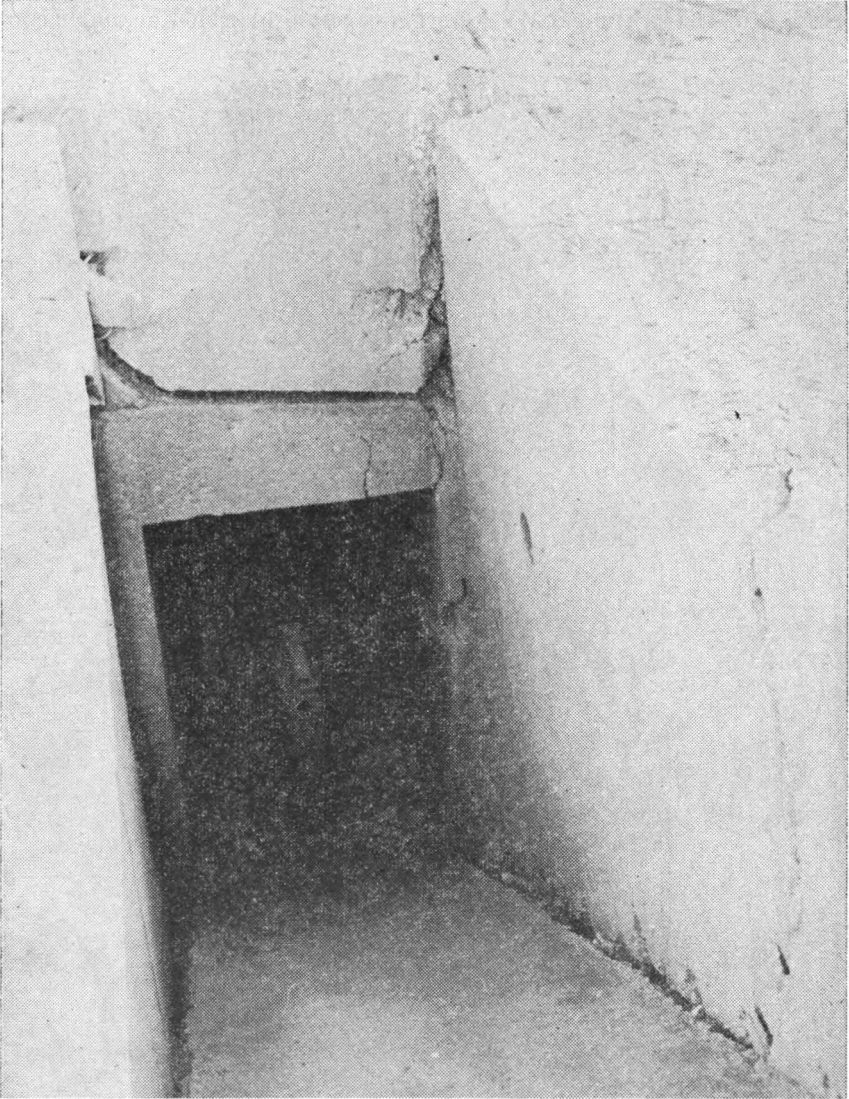
Mr. HOLIFIELD. What pressure did you have there ?

Mr. SAUNDERS. The actual pressure was somewhat less than anticipated. It was about 120 pounds per square inch rather than 132. Slide No. 41 is a typical West German rectangular shelter under con-



SLIDE No. 41.—Typical West German shelter under construction.

struction. Instead of receiving 265 pounds per square inch at the shelter closest to ground zero, a peak pressure of approximately 190 pounds per square inch was received. The damage to the close-in German structures was mainly limited to heavy cracking in the entrance as shown in slide No. 42. Minor cracking was noted inside several of the



SLIDE No. 42.—Damage to close-in German structure.

shelters at the highest overpressure ranges. FCDA will make as much information available to the French and West German Governments as is consistent with our national security and will use any of their techniques worthy of adoption.

In addition to the programs conducted directly by FCDA, we jointly financed the following programs to obtain information required to further establish civil defense criteria :

1. Missile dust and blast biology studies by the Lovelace Research Foundation which were described yesterday by Dr. White.
2. Decontamination of water supplies by the Corps of Engineers.
3. Decontamination of foods and packaging by the Food and Drug Administration.
4. Aerial radiological monitoring studies by the University of California of Los Angeles and the New York Operations Office of the Atomic Energy Commission.
5. Basic weapons effects by Edgerton, Germeshausen & Grier.

In the past FCDA has not tested shelters specifically designed to provide only fallout protection. By instrumenting existing structures and by making basic depth dose measurements, sufficient data were obtained to develop fallout (shelter design) criteria. However, with the increased emphasis now being placed on fallout shelter features, it is planned to stress this area in future tests.

In conclusion, considerable progress has been made in the FCDA testing program which has greatly influenced overall civil-defense planning. We have kept pace with the development of weapons.

Slide No. 43: Initially, we tested simple structures designed to give protection from the blast and radiation of a small nominal yield weapon of that time. In Operation Plumbbob, our testing program was large and complex and included testing of shelters capable of providing a high degree of protection from long-duration blast waves, high levels of initial radiation, and the heavy concentration of fallout created by the megaton-type weapons.

FCDA participation in test operations has resulted in a large number of experienced staff, in addition to Federal, State, and local officials, and industrial engineers who have gained a personal knowledge of weapons effects.

Technical reports resulting from the FCDA sponsored programs have made a major contribution to the knowledge of weapons effects. Our reports have been issued to technical personnel of Federal, State, and local organizations, and many of our reports have been paraphrased for the public education program.

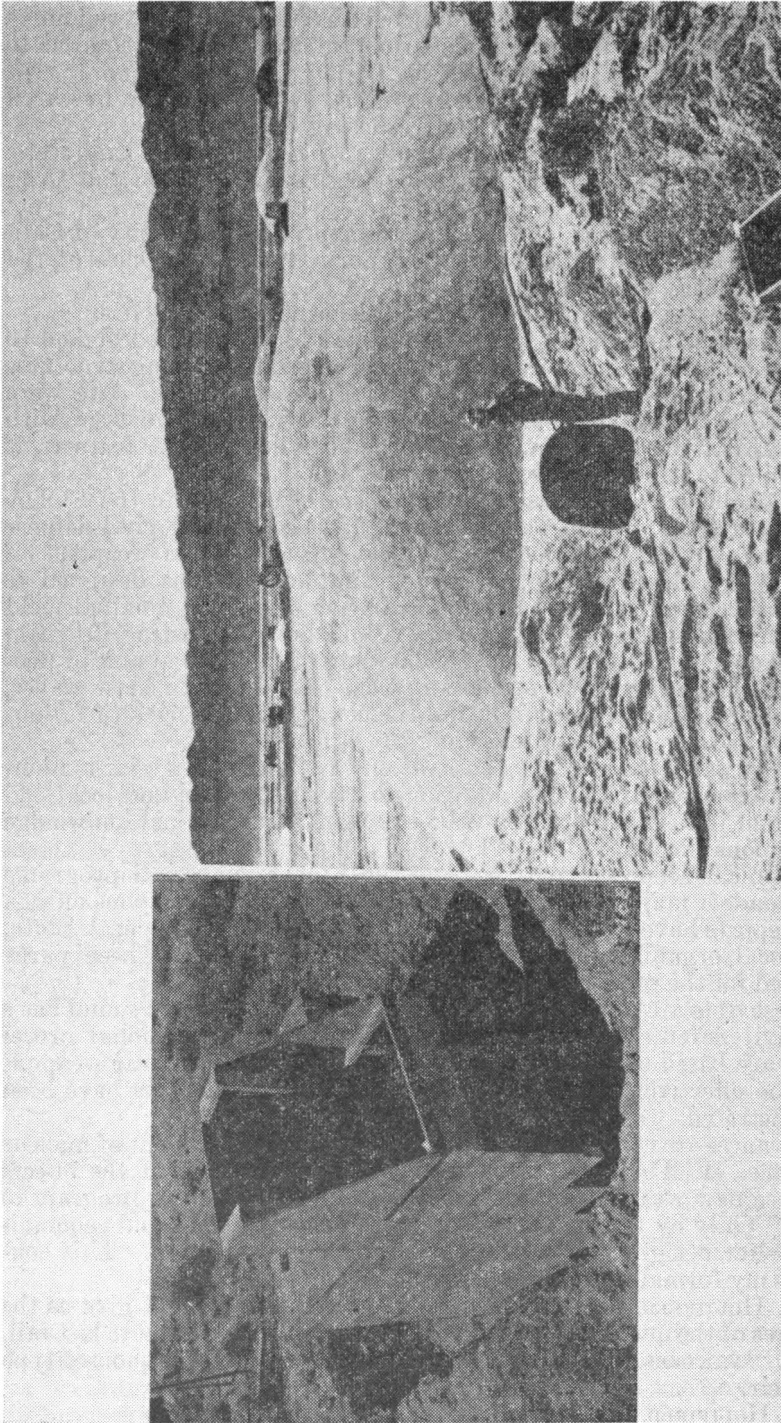
These tests are of the highest significance in providing a sound basis for civil defense planning and programs. Our operational procedures are based on firsthand knowledge of effects of nuclear weapons and the effectiveness of our recommended shelter designs have been demonstrated.

Advances are continuously being made in the development of nuclear weapons. FCDA must continue to be knowledgeable of the effects of these new weapons and gear our planning and testing program to them. Only by testing can we derive the most efficient and economical shelter designs and be assured of effective protection. This concludes my formal presentation, sir.

Mr. HOLIFIELD. Thank you, sir. I noticed you did not give us the pictures of the quonset-type hut test which was made out there last fall.

Mr. SAUNDERS. FCDA did not sponsor any of the quonset-type tests, sir.

Mr. HOLIFIELD. Those were the AEC.



SLIDE No. 43.—Comparison of early test structure with dome in Operation Plumbbob.

Mr. SAUNDERS. There were two different tests. One was the quonset type which was described yesterday by AEC, that is NRDL under contract to AEC, and the other was the DOD sponsored quonset.

Mr. HOLIFIELD. There were other DOD structures besides the Navy's.

Mr. SAUNDERS. Yes, sir.

Mr. HOLIFIELD. Do you have reports on those tests also?

Mr. SAUNDERS. We are now receiving interim test reports of the military tests.

Mr. HOLIFIELD. What type of structures did they have in comparison with the type you had?

Mr. SAUNDERS. They had domes which were similar in size to ours with the exception of wall thickness. Theirs were heavier. Of course, theirs were designed for a different purpose. They were interested in the blast phenomena and how the pressure waves acted as they passed over the structure. We were interested in response, that is, how does a structure of this shape respond to blast loading. They also had some underground ammunition bunker-type structures which are the arch type. They also tested aboveground arch structures and then they tested some corrugated steel pipe structures.

Mr. HOLIFIELD. Any questions of Mr. Saunders?

Mrs. Griffiths.

Mrs. GRIFFITHS. Did I understand that these were not tested for radioactive fallout?

Mr. SAUNDERS. No, ma'am. The family shelters were heavily instrumented for radioactivity, not only fallout, but initial and neutron radiation. The garage had the same instrumentation. The dome was not instrumented for radiation protection because it did not have the earth cover. We were interested in the response of the dome under blast loading and not its sufficiency in giving protection from radiation.

Actually, you see in use as the model demonstrates back here, the dome would have been sufficient earth cover to give it the radiation protection required.

Mrs. GRIFFITHS. Then may I ask, Mr. Chairman, I do not know which one should answer, but why do you not suggest or support or do both, an amendment to the Housing Act which does not permit Federal money to insure housing that does not have a shelter?

Mr. SAUNDERS. I think that Mr. Gallagher would probably be the one to answer that.

Mr. GALLAGHER. Thank you very much. I do not have a very good answer to that, Mrs. Griffiths. I remember our discussions in the past on the same subject. We have so urged, but this gets to be an action that another agency undertakes. It has not been undertaken to secure the new authority that they insist they need for the inclusion of the cost of shelters in the appraised value of housing. This is their problem. Presently they cannot include the shelter cost in the appraised value. They say they need legislation.

Mrs. GRIFFITH. I would be glad to sponsor such legislation. It comes before Banking and Currency. The housing bill will be up shortly, and I think if you are really convinced that it protects, then it seems that the fastest way to get shelters built in this country is for the Federal Government to say no house is really worth anything that does not have a shelter.

Mr. GALLAGHER. Well, I think you heard me talking about the emergence of policy here which we are anticipating and maybe that sort of thing will be said, I do not know. But let me check again with the housing agency on the point you are making here.

Mr. HOLIFIELD. Well, as a matter of fact, let us face it. There is no national policy for shelters. That is the reason for it. The basic reason is that there has been no policy adopted by the Federal Government advocating shelters or recognizing that shelters are needed in the nuclear age and as a result of no policy, there are no recommendations for legislation, either to allow tax amortization or special tax privileges for people who would install their own or to give Federal assistance to the protection of lives of people in the case of attack.

Mr. LIPSCOMB. Mr. Chairman, did Mr. Gallagher say this was included in the proposal of December 1956 or not, this type of proposal?

Mr. GALLAGHER. The proposal of 1956 did anticipate the inclusion of shelters in houses; yes.

Mr. LIPSCOMB. It has nothing to do with the Housing Act.

Mr. GALLAGHER. It did not relate or refer to the Housing Act. This was simply a concept of what level of protection and where it ought to be and what it would cost as I said before.

Mr. HOLIFIELD. You confined your recommendation to the protection that would be given under such circumstances but you did not, of course, attempt to set policy which was beyond your scope of jurisdiction?

Mr. GALLAGHER. That is correct.

Mr. HOLIFIELD. The fact that you recommended it, however, indicates that you feel that such a procedure would be beneficial, providing that public policy is set?

Mr. GALLAGHER. But at the same time we appreciate all of the other problems or aspects of this problem that bear on any ultimate decision.

Mr. HOLIFIELD. Well, whether you appreciate it or not has nothing to do with it. There you mean that you recognize there are other problems?

Mr. GALLAGHER. Yes, sir.

Mr. HOLIFIELD. Any further questions? If not, why thank you. Thank you, Mr. Saunders.

Mr. GALLAGHER. The next witness will be Mr. Benjamin Taylor who is Director of our Engineering Research and Development Office in FCDA. He is going to talk about the status of shelter planning, design and research.

Mr. HOLIFIELD. Mr. Taylor, we remember your testimony before the committee once before. We are glad that you are still with the FCDA and can give us the benefit of your long years of experience in this field.

STATEMENT OF BENJAMIN TAYLOR, DIRECTOR, ENGINEERING RESEARCH AND DEVELOPMENT OFFICE, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. B. TAYLOR. I am happy to be here, sir.

Mr. HOLIFIELD. You have been studying this shelter program for quite awhile?

Mr. B. TAYLOR. Yes, I have been associated with it intimately for 5 or 6 years.

Mr. HOLIFIELD. When did you start on shelter data?

Mr. B. TAYLOR. Actually I got into it most extensively 4½ to 5 years ago.

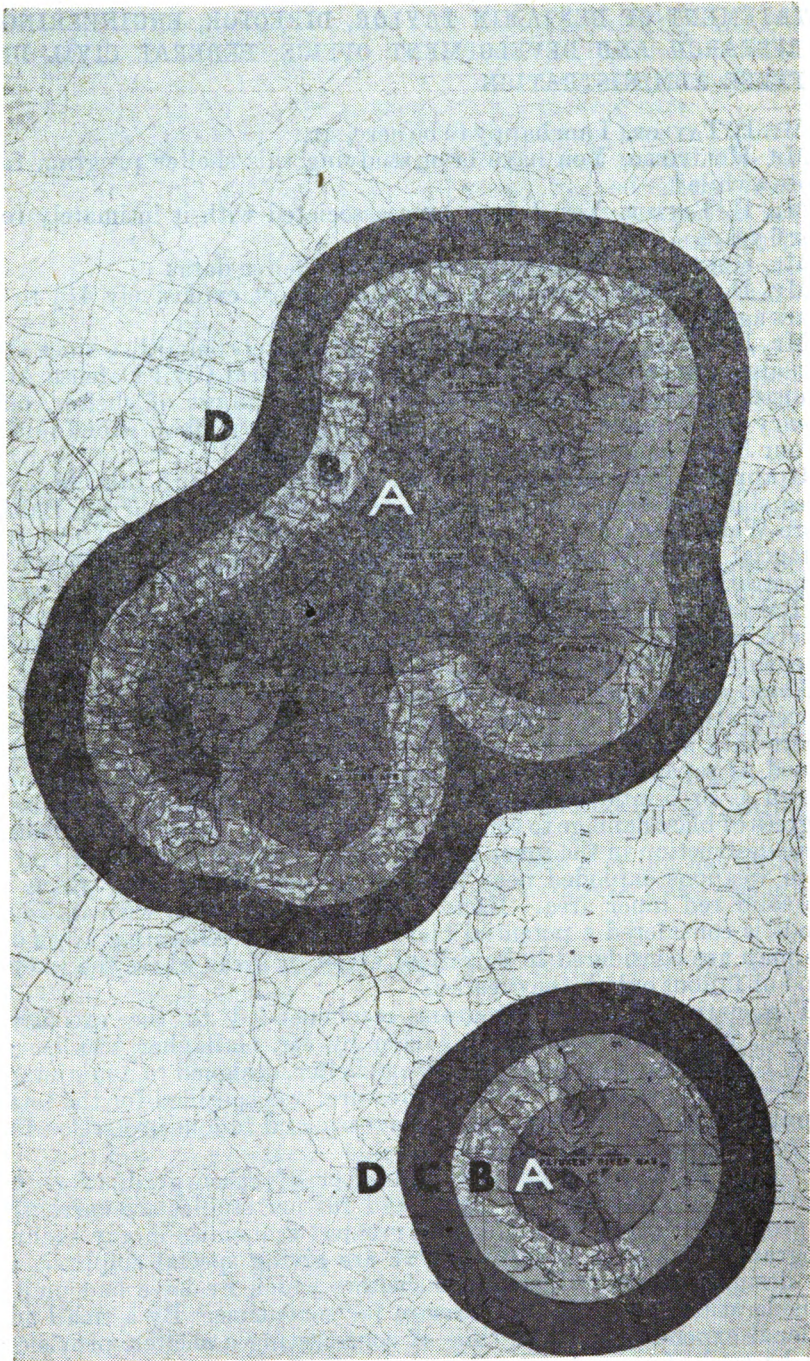
Mr. Holifield, ladies and gentlemen of the subcommittee, since the last appearance by representatives of the Federal Civil Defense Administration before your committee on the subject of shelter, our agency has adopted a new concept of target areas upon which much of our broad shelter planning has been based.

It appears desirable, therefore, to acquaint you with this concept. (See slide No. 44.) On the screen you will see a map of the Baltimore-Washington area. On this map are shown several of the 315 potential target areas recognized by the Federal Civil Defense Administration. The small solid red areas encompassing a target such as Baltimore, Washington, Patuxent River Naval Test Center, and others, represent those areas within which we believe it is most likely an enemy would attempt to place his weapons.

These areas comprise population densities, important industrial concentrations, major airports, military installations and the like, where they are so closely grouped that they cannot be logically construed as separate targets. Around each of these aiming areas are shown 4- or 5-mile wide bands which indicate varying anticipated degrees of blast damage to conventional structures (ranging from complete destruction in the inner ring to minor damage in the outer ring) from weapons exploded near the edge of the aiming area, which is the solid red inner area. Each of these aiming areas with its four bands is considered a potential blast area and all remaining areas on the map are considered to be fallout areas, or areas where the likelihood of fallout only is the greatest.

The national shelter program recommended to the executive branch, which was referred to earlier by Mr. Gallagher, was based upon this aiming area concept. Blast shelter, designed to a minimum of 30 pounds per square inch overpressure, was specified for the total population in the blast areas of the country, and fallout protection for the total population in the fallout areas.

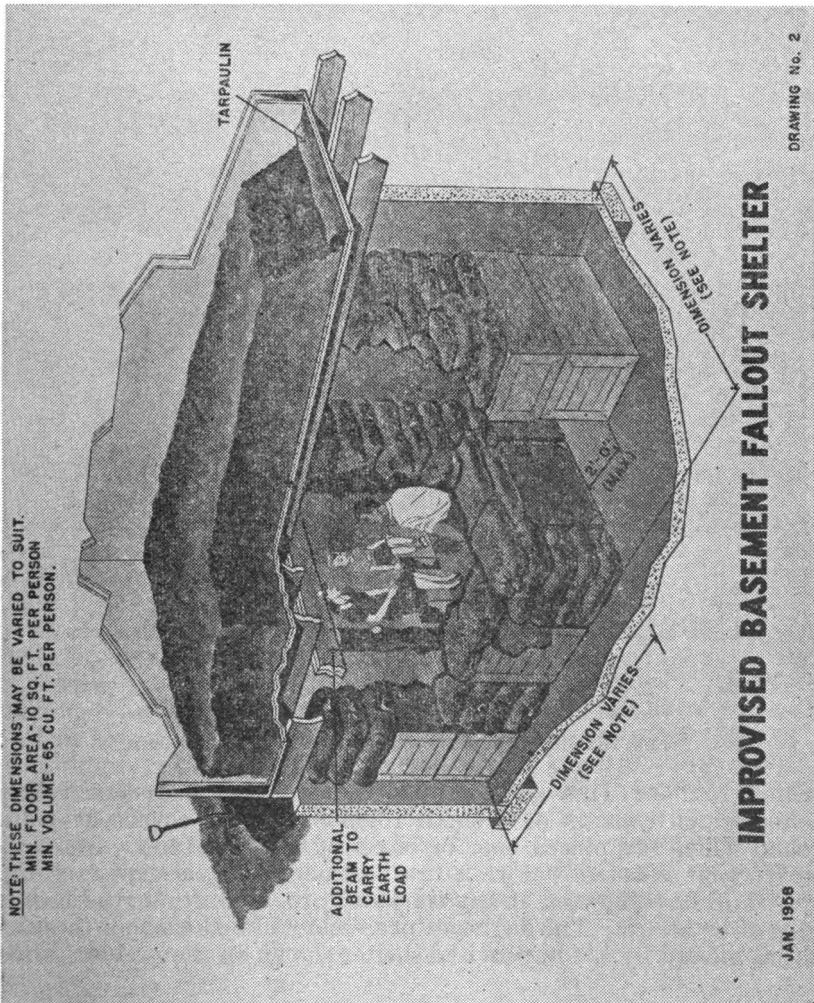
Studies have been made for a number of other graduations of shelter throughout the blast areas and further studies are currently in progress. In order to effect the greatest economies in any shelter program which may be initiated, we are giving special emphasis to the design of improvable fallout shelters which we have had under consideration as a practical measure for some time. By a small additional expenditure at the time of constructing a shelter, provision can be made for converting this shelter later, at an additional cost, to a shelter having a high degree of blast resistance with considerable saving over the construction of a new blast shelter.



SLIDE No. 44.—Map of the Baltimore-Washington area.

With this brief background of shelter location criteria, I will proceed to describe, with the aid of slides, some of the shelter designs which have been prepared by the Federal Civil Defense Administration. These designs and others that are being developed constitute a part of an overall program of providing the public with a wide variety of shelter plans to meet varying requirements. As you will see, they range from the simple do-it-yourself, improvised shelters for one family to large underground structures providing shelter for several hundred people or more. The designs vary from a minimum type providing fallout protection only to structures providing protection from initial radiation, blast, heat, and residual radiation.

Slide No. 45: The slide now on the screen, depicts an improvised fallout shelter in the corner of the basement of an existing home. This represents one of the simplest forms of protection against fallout which can be constructed from materials usually available around the

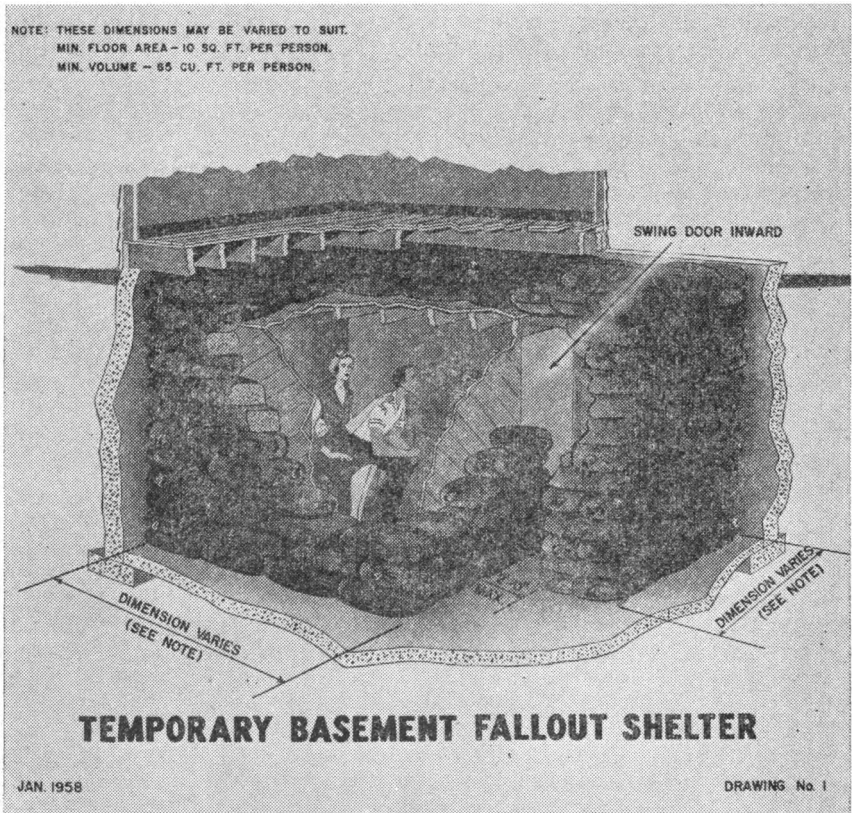


SLIDE No. 45.—Improved basement fallout shelter.

average home. If properly constructed, stocked and equipped, an improvised shelter such as this offers its occupants a good chance of survival without undue hazard where the intensity of fallout is not of a high order.

You will note the floor above the shelter has earth piled on a tarpaulin. We do not advocate that people place this earth cover in a room of their house during peacetime, but it is a measure that could be taken quickly should there be a strategic warning or the world situation become very grave.

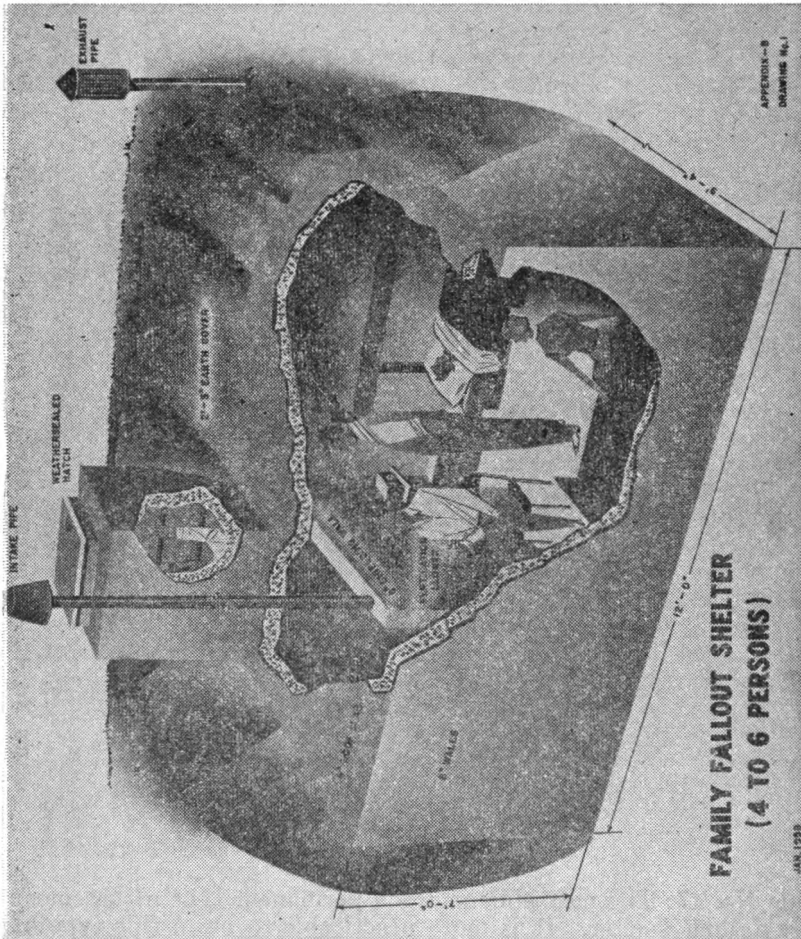
The shoring of the floor above, and the provision of shielding with boxes and bags of earth or sand can be accomplished in advance of the actual need for the shelter.



SLIDE No. 46.—Temporary basement fallout shelter.

Slide No. 46: This slide depicts a temporary basement fallout shelter which consists of a small room built in a corner over and around which are placed bags or boxes of earth or sand. Since the construction is entirely within the basement area, a shelter of this type could be completed at any time and provide instant readiness in event of an attack. The degree of protection offered is about the same as that offered by the improvised shelter shown on the previous slide.

Slide No. 48: This next shelter represents a simple, permanent type of outside underground fallout shelter. When properly stocked and equipped, a shelter of this type will offer its occupants a good chance of survival without undue hazard even in areas of heavy fallout.



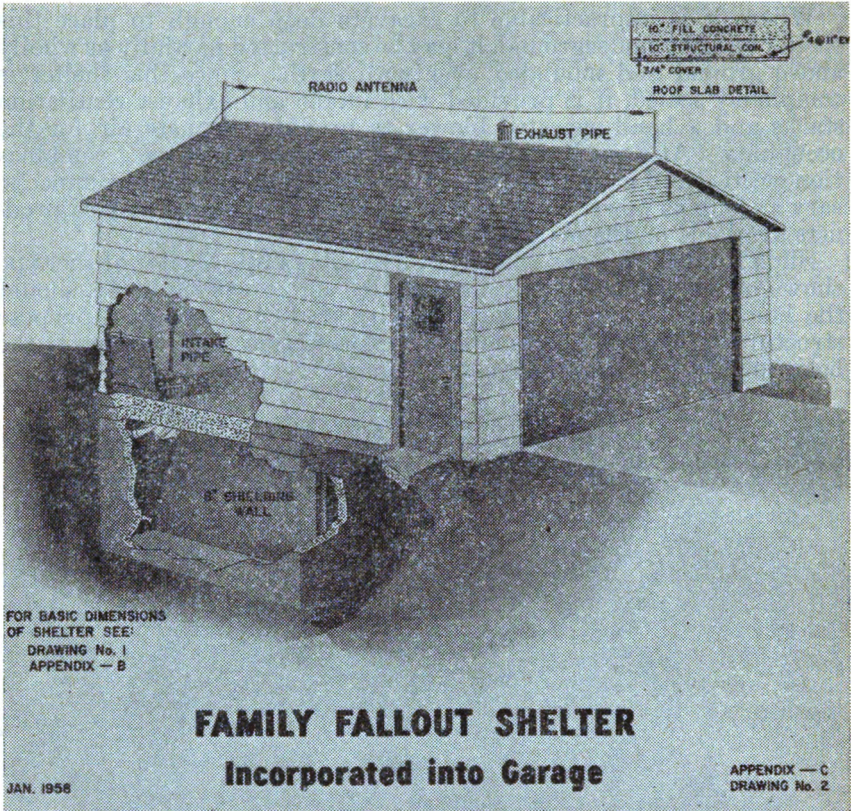
Slide No. 48.—Permanent type of outside family underground fallout shelter (4 to 6 persons).

Where it is impracticable to excavate deep enough to place this shelter entirely underground, it may be constructed partially or wholly above ground and mounded over with earth. Since this shelter is completely sealed, it is provided with intake and exhaust ventilation stacks and a hand-operated blower to provide adequate air for the occupants. At a small additional cost the blower may be a combination electric and manual drive so that hand cranking will be unnecessary as long as power remains on. These blowers are standard products available on the market today.

Slide No. 49: This next slide shows a basic family shelter of the type shown on the previous slide incorporated into a garden house, should the homeowner wish to incorporate his shelter into a dual-purpose structure. It offers the same level of protection from fallout as the basic underground fallout shelter.



SLIDE No. 49.—Family fallout shelter incorporated into garden house.

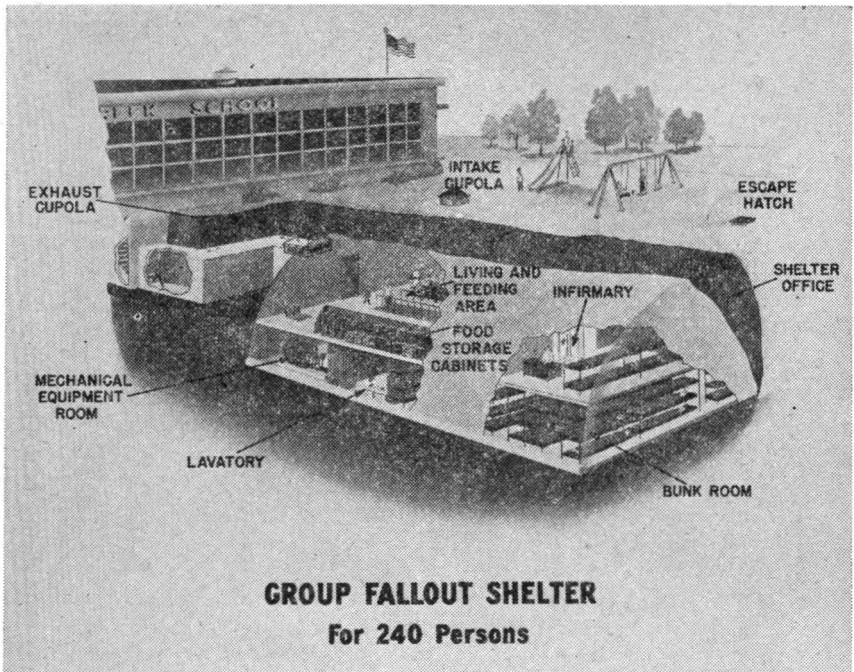


SLIDE No. 50.—Family fallout shelter incorporated into garage.

Slide No. 50: Here again is another dual-purpose combination, that of a shelter combined with a garage. The shelter portion of the structure is essentially the same basic fallout shelter which offers the same level of protection.

Slide No. 51: The next slide shows a group fallout shelter which would accommodate about 240 persons. It is a corrugated metal arch type structure, on a concrete base slab, installed underground with 3 feet of earth cover. It is completely equipped with ventilating, water supply, sanitary, and electrical systems.

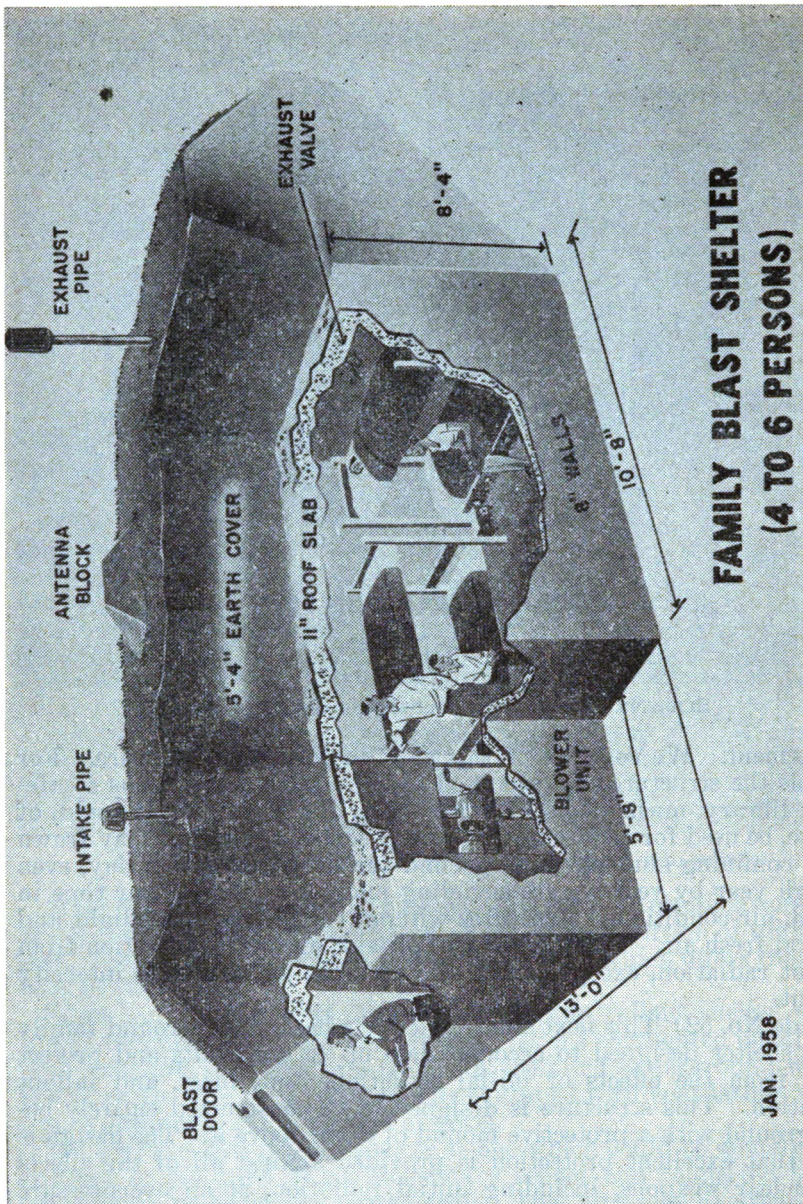
We envision this type of shelter as one which could be quickly constructed in the yard of an elementary school and connected to the school by an underground passageway. The entry may be either from the basement of the school or from the first floor, should it not have



SLIDE No. 51.—Group fallout shelter for 240 persons.

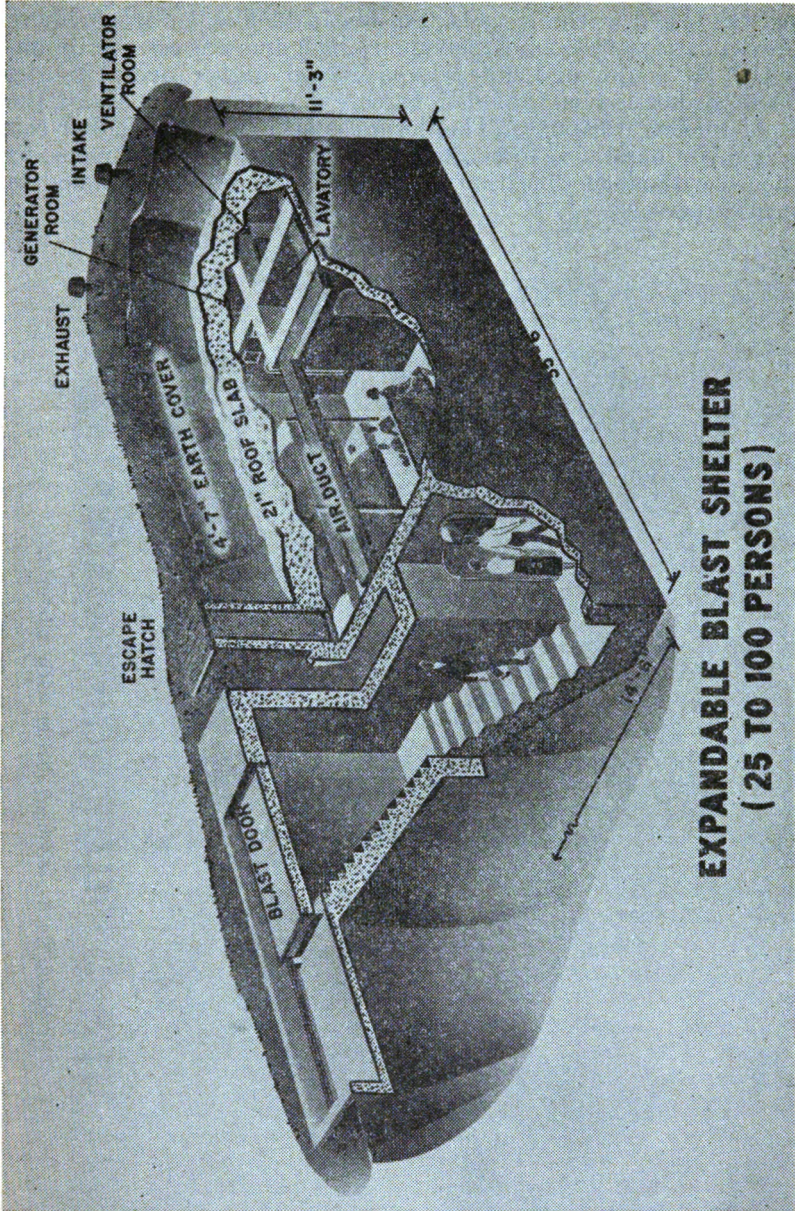
a basement. We conceive of this as a dual-purpose structure. For schools the structure could be used to house such activities as a cafeteria, library, musicrooms, exercise space, and so forth. It could, of course, be used for classrooms, but many school authorities may frown upon confining students underground for the entire school day, even though year by year we are spending more and more of our time in closed, air-conditioned structures without the benefit of sunlight and natural fresh air. This shelter will provide excellent protection from fallout radiation, except in the limited areas of very high intensity fallout.

Slide No. 52: This next slide depicts the basic underground family blast shelter designed to accommodate up to six adults and protect them from the effects of initial radiation, heat, blast, and fallout radiation. This structure is designed to be constructed entirely below ground with a protective mound of earth above it. The design is such that excellent protection is provided against all of the effects of nuclear weapons, including initial radiation, at an overpressure range of 30 pounds per square inch or higher. In actual tests in 1957



SLIDE NO. 52.—Family blast shelter (4 to 6 persons).

at the Nevada test site the structure sustained without damage overpressures more than double the 30 pounds per square inch for which it was designed. It is our plan to further test this shelter in the Pacific under the long-duration megaton weapons. There appears to be no question that it will be more than adequate for its design overpressure even under these more severe conditions.

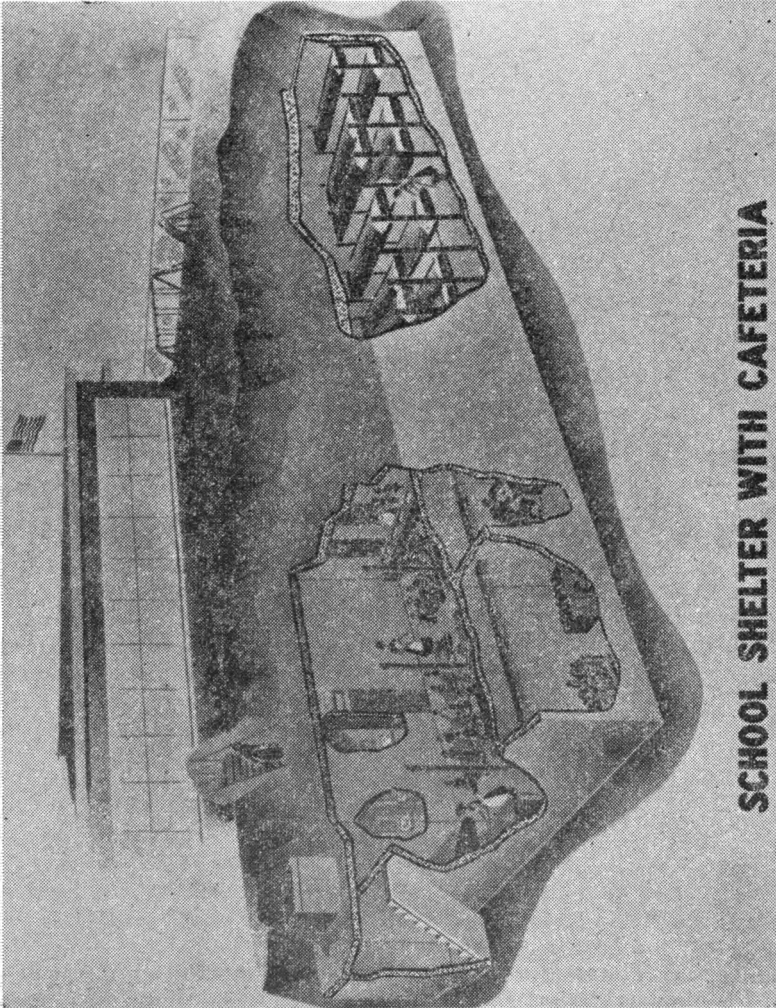


**EXPANDABLE BLAST SHELTER
(25 TO 100 PERSONS)**

Slide No. 53.—Expandable blast shelter (25 to 100 persons).

Slide No. 53: The shelter shown in this next slide was originally designed for industry, particularly for closed-down crews. As you know, steel mills, chemical processing plants and other industries of this type can not be simply abandoned without being self-destructive. They can, however, be closed down in a period of an hour or two so they will not be self-damaging, provided crews can return after a day or so. This situation may exist in many of the target areas which are not hit by the enemy or which are only partially destroyed. This

shelter was tested at the Nevada test site in 1955 at an overpressure of approximately 100 pounds per square inch and was essentially undamaged. It could, undoubtedly, withstand higher overpressures. Complete protection is provided in this design against all of the effects of nuclear weapons. The design is such that the shelter can be built in its basic size to accommodate about 25 or 30 persons, or lengthened without modification of structural design to accommodate 100 or more persons.



SLIDE No. 54.—School shelter with cafeteria.

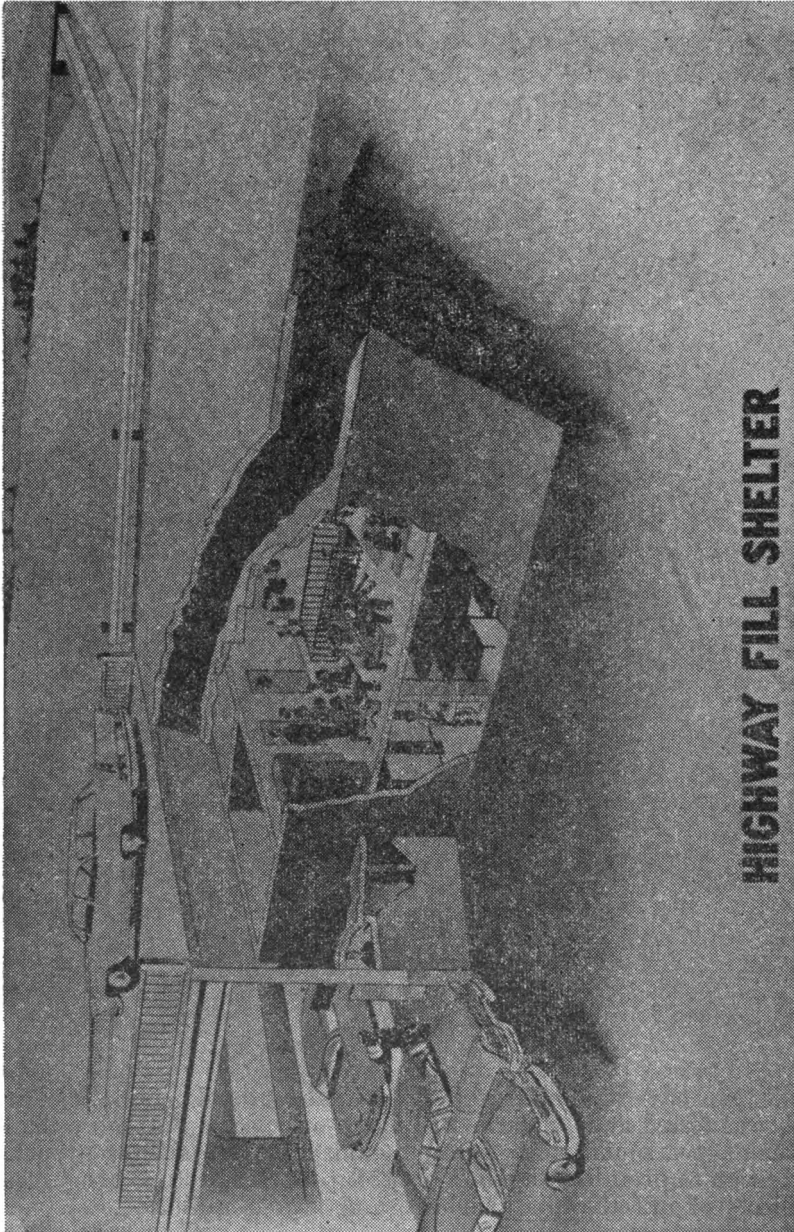
Slide No. 54: The next slide shows a preliminary design we have made of an underground rectangular reinforced concrete shelter which may serve as a school cafeteria. Construction drawings and specifications have not been completed for this shelter. It can be designed for either fallout or blast protection.

**UNDERGROUND GARAGE SHELTER**

SLIDE No. 55.—Underground garage shelter.

Slide No. 55: This slide shows the underground garage shelter which was tested at Nevada in 1957 at an overpressure of more than 30 pounds per square inch without damage to the shelter proper. In addition to protection against blast, it provides protection against the effects of initial radiation, heat, and fallout radiation.

Slide No. 56: The slide now on the screen shows a preliminary design of a shelter which may be incorporated in the fill of a highway overpass. Construction drawings and specifications for this shelter have not yet been completed. It may be designed for fallout protection or any reasonable degree of blast protection. There has



Slide No. 56.—Highway fill shelter.

been a great deal of public interest expressed in combining shelter construction with the new highway construction program. While we feel that this capability may be somewhat exaggerated in the public mind, we do see the possibility of blending these two programs to a limited extent.

Slide No. 57: This slide shows, perhaps in a somewhat crude manner, how a subway could be converted so as to be available for use as a fallout shelter. Rooms would be constructed adjacent to the subway to house ventilating equipment, power generating equipment, sanitary



SLIDE No. 57.—Subway-tunnel shelter.

facilities, food, bedding, and other related equipment. The tables and bunks shown in the drawing would be removed from storage and erected after occupancy of the shelter in an emergency.

In addition to what I have shown you here, our agency is engaged in contracting for the design of numerous other prototype shelter designs, including a multistory underground garage shelter, an elementary school incorporating dual-purpose underground shelter space functionally integrated with the aboveground school space, a prototype dome shelter and other types. In each case there will be several designs, one for fallout only, another for an improvable fallout type, and also designs for 30 pounds per square inch blast overpressure and perhaps 50 to 100 pounds per square inch overpressure.

We also have numerous research projects underway, in the process of negotiation, or planned to obtain fundamental engineering data requisite to the design of economical shelters.

I have here a book of sketches and narratives pertaining to the shelters which I have just described which I will be glad to leave with the committee, if you so desire. Models of some of these shelters are on display in the back of the room for your inspection.

Now, there is an additional study we have had undertaken in regard to shelter designs that I particularly wish to acquaint you with, since it is a rather bold and interesting concept. This study involves the design of shelters in the deep rock strata under our cities for the total city population.

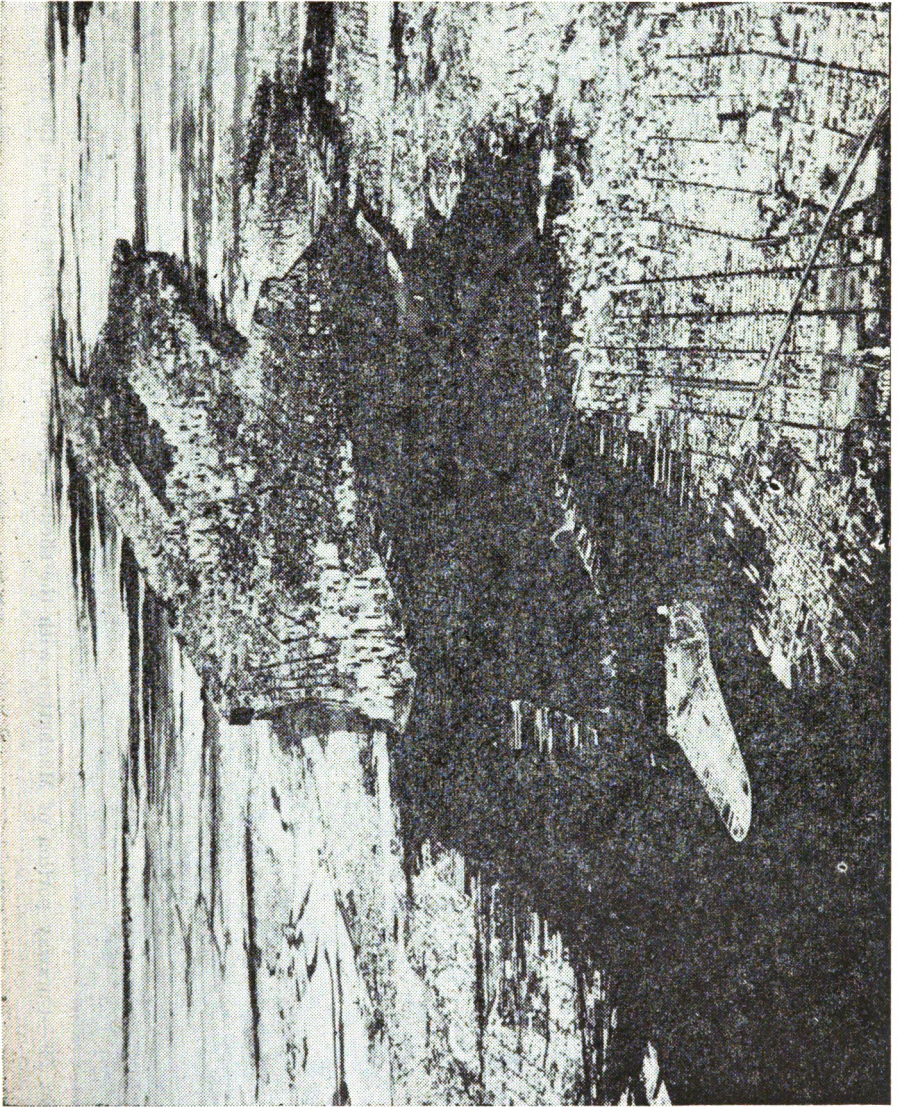
Under many of our cities there exists at some level, ranging from several hundred to a thousand feet or more down, a rock stratum suitable for this purpose. The firm of Guy B. Panero Consulting Engineers, New York City, has been conducting this study for us for several of our big cities, with emphasis being placed on a rather complete design for the Borough of Manhattan in New York City.

These shelters are designed to be constructed 800 feet below the surface in solid rock to accommodate the total population of Manhattan Island. Ramp entrances would be provided throughout the city in such numbers that the total population could be within the first blast door in about 25 minutes.

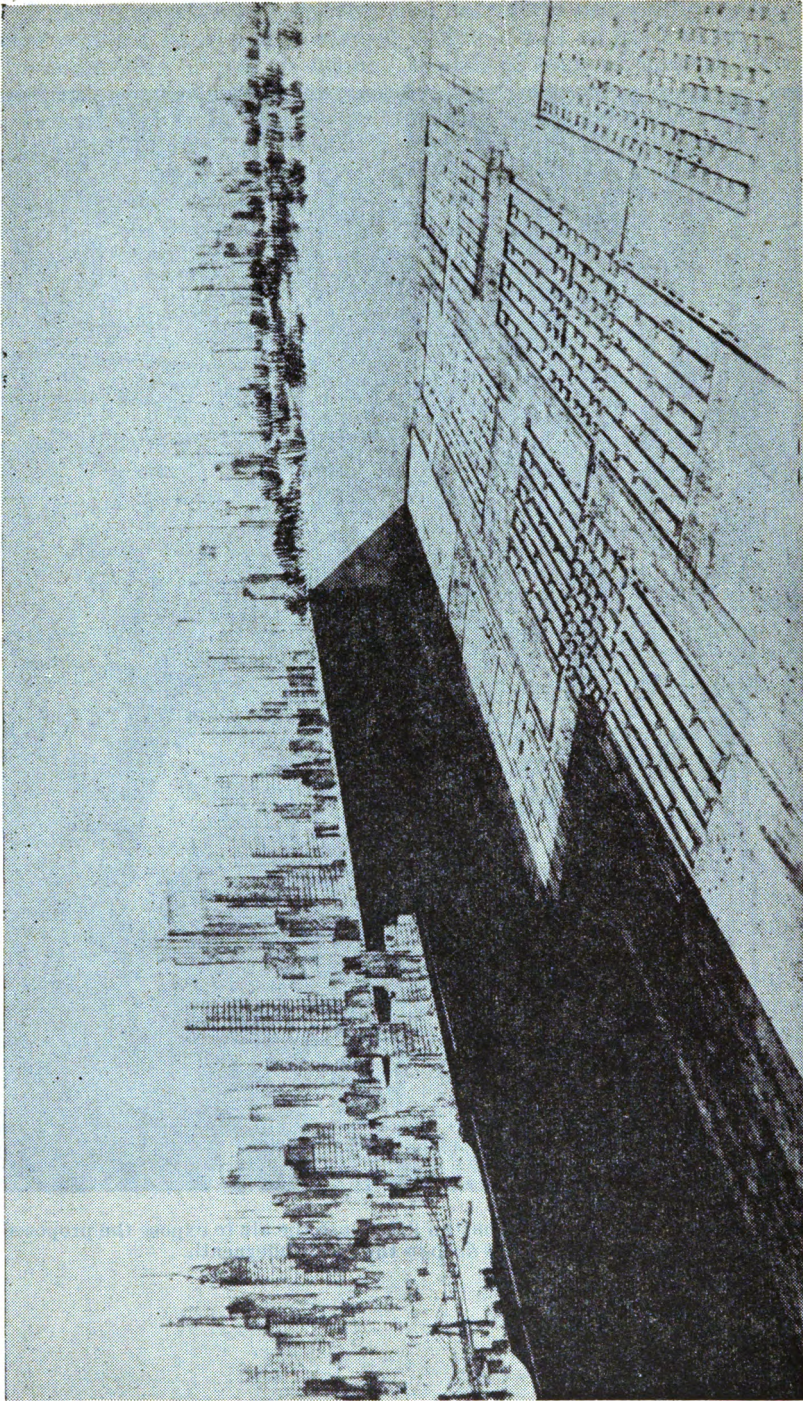
Slide No. 58: The slide now on the screen shows the island of Manhattan lifted into the air to expose the proposed layout of shelters deep in the rock underneath. Studies show that this plan is entirely feasible and practicable, except possibly in certain limited areas where rock faults may make construction difficult or impractical. The blank space in the shelter layout on the screen is one of these areas where there are rock faults.

Slide No. 59: The next slide shows a cutaway portion of the island of Manhattan with the shelter layout at the 800-foot level in the rock. Construction would not be by excavation from the surface, however, except at several points to start the project. It would, instead, be from the inside out, with the rock carried by conveyor belts to the East River or Hudson River and loaded directly on barges for transporting to sea for dumping. Normal rock-excavating methods would be used, the excavated spaces being sufficiently large to accommodate power shovels and other necessary equipment of this type.

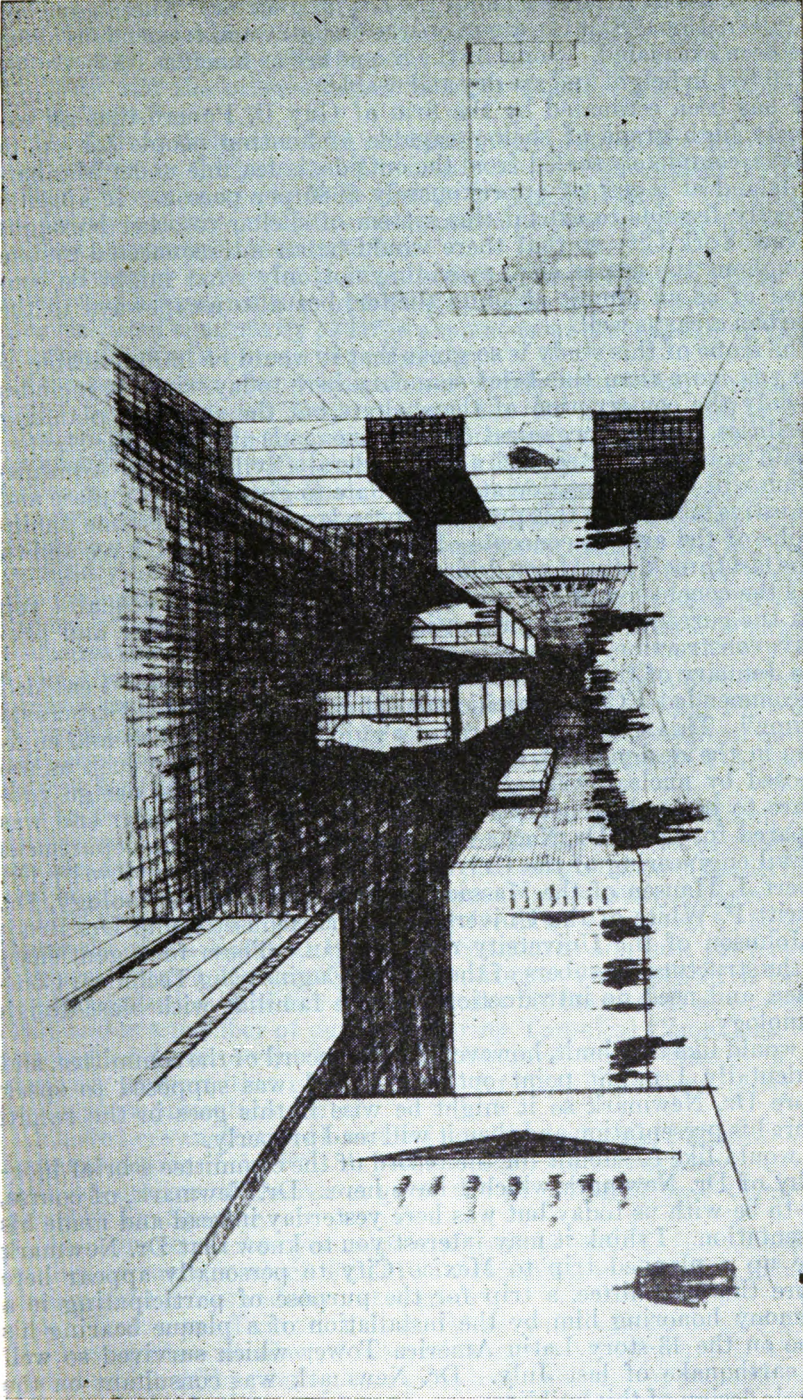
Slide No. 60: This slide is an artist's concept of an interior view of one of these shelters. As you may know, precedence exist for large-scale construction at this level under cities in the form of the



SLIDE No. 58.—The Island of Manhattan lifted into the air to expose the proposed layout of shelters deep in the rock underneath.



SLIDE No. 59.—Cutaway portion of Manhattan with the shelter layout at the 800-foot level in the rock.



SLIDE No. 60.—Artist's concept of an interior view of shelter under Manhattan Island.

salt mines about 1,100 feet under the city of Detroit. These mines of the International Salt Co. are in operation today and tremendous areas have been excavated. Some of the rooms are as much as 60 feet wide and 20 feet in height and are dry and usable.

It has been estimated by the firm of Guy B. Panero that an extremely high grade of shelter capable of housing people for up to 90 days, completely sealed from the outside, is feasible under Manhattan Island at a cost of approximately \$680 per person. It appears perfectly feasible to extend this system of shelter to other boroughs of New York City so that there would be an interconnected system throughout the entire city, providing not only what might be conceived of as an almost absolute shelter, but also escapeways to the suburban areas as well.

The scope of this study is so great that it would be impracticable to give you more than this brief summary here today, since it includes not only the construction of the shelters but the complete planning of utilities, feeding, organization and management within the shelter. Should your committee desire, the Federal Civil Defense Administration will be in a position at a later date to give you a complete and exhaustive briefing on this project. I can leave you at this time photographs of the artist's concepts of these shelters which I have shown in the last three slides, if you desire them.

As the conclusion of the presentation, I would like to acquaint you with the current FCDA publications pertaining to shelter and protective construction.

In January of this year we published Technical Report 5-1 entitled "Recommended FCDA Specifications for Blast Resistant Structural Design." This specification provides guidance to architects and engineers in the design of structures to resist blast loadings such as are imposed by nuclear weapons. It is the first simplified design procedure to be made generally available in unclassified form and was prepared for us by Dr. Nathan N. Newmark, head of the department of civil engineering of the University of Illinois, with review by Dr. Robert J. Hansen of the Massachusetts Institute of Technology, Dr. Merritt P. White of the University of Massachusetts, and Dr. Bruce G. Johnson of the University of Michigan. These four gentlemen are the structural members of the FCDA Engineering Technical Committee, and need no introduction to those familiar with blast-design technology.

I would like to submit, however, for the record of the committee, and incidentally I might point out here that I was supposed to speak before Dr. Newmark so it might be wise if this goes in the record before his presentation and then it will read properly.

I would like to submit for the record of the committee a brief biography of Dr. Newmark which I have here. Dr. Newmark, of course, was to be with us today but was here yesterday instead and made his presentation. I think it may interest you to know that Dr. Newmark gave up a planned trip to Mexico City to personally appear here before this committee, a trip for the purpose of participating in a ceremony honoring him by the installation of a plaque bearing his name on the 43-story Latin America Tower which survived so well the earthquake of last July. Dr. Newmark was consultant on the seismic design of this building.

Just recently the Federal Civil Defense Administration technical staff has completed two interim technical bulletins on home shelters, one entitled "Family Shelters for Protection Against Radioactive Fallout" and the other entitled "Family Shelters for Protection in Blast Areas."

The fallout shelter bulletin has been given preliminary distribution and is now in the process of printing at the Government Printing Office. It will be available in another 2 weeks, I think. The bulletin on family shelters in blast areas is in the process of being forwarded to the Government Printing Office.

Preliminary orders for the family fallout shelter bulletin have indicated that a first printing of 2 million copies will be required, and it is anticipated that nearly as large a quantity of the bulletin on family blast shelters will have to be printed.

Our agency has also prepared and widely distributed a paper entitled "Recommended Requirements for Both Blast and Fallout Shelters" which lists the recommended criteria for shelter design and habitability. We have also prepared and widely distributed a brief paper on "Shelter for Schools" and have prepared two papers on improvised fallout shelter, one for distribution to the public during peacetime so that adequate preparation can be made by the individual or family, and the other for emergency distribution in the event of the declaration of a national emergency resulting from a threat of enemy attack. This latter bulletin outlines immediate emergency measures that can be taken for personnel protection.

Another extremely important publication under development at the present time will be entitled "FCDA Guide for Planning Protection From Radiation." This will be a counterpart to the technical bulletin prepared for us by Dr. Newmark, the "Recommended FCDA Specifications for Blast Resistant Structural Design."

The present bulletin, that is, the structural design bulletin, gives guidance to the architect and engineer in the structural design of shelter, and the proposed bulletin will provide guidance to the architect and engineer in the design of structures to attenuate radiation.

This latter guide is being prepared for us by Dr. Lewis V. Spencer, formerly of the National Bureau of Standards and now professor of physics, Ottawa University, Ottawa, Kans. Dr. Spencer is one of the recognized authorities in the country in the radiation protection field and is a member of our Engineering Technical Committee. We are indeed fortunate in having Dr. Spencer, whose time is in such demand, prepare this guide manual for us. He is here today and will make a presentation later.

I have here another book which I can leave with the Committee that includes copies of the FCDA publications I have mentioned, together with an outline of the coverage of the proposed manual being prepared by Dr. Spencer.

Mr. HOLIFIELD. Are you also equipped to give us the number of studies or surveys which FCDA is conducting now in this field and the kind of surveys and the cost of them?

Mr. BENJAMIN TAYLOR. I do not know what you mean by surveys. We have quite a number of research projects associated with shelter, one of which will probably be a pilot shelter survey of a city to determine available locations and requirements for shelter.

Mr. HOLIFIELD. Well, I am talking about your contracts with outside groups for different types of research and study and surveys in the field of civil defense.

Mr. BENJAMIN TAYLOR. As pertains to shelters, sir, could I send you that?

Mr. HOLIFIELD. Yes.

Mr. MINSHALL. That figure you gave a moment ago of cost per person for building a shelter under Manhattan, what was that figure again?

Mr. BENJAMIN TAYLOR. \$680 per person. This is a very high-grade shelter.

Mr. MINSHALL. What is the population of Greater Manhattan?

Mr. GALLAGHER. This study was based on a population of 2½ million, the actual peak.

Mr. MINSHALL. That would be \$28 billion just for Manhattan, would it not?

Mr. BENJAMIN TAYLOR. Again depending on whether you based it on the daytime population or resident population. You would base it on the daytime population.

Mr. MINSHALL. \$28 billion.

Mr. BENJAMIN TAYLOR. No, less than 2½ billion.

Mr. MINSHALL. I have an accountant sitting next to me who gave me these figures. I am just a lawyer.

Mr. BENJAMIN TAYLOR. Well, this shelter, of course, provides everything for people to live sealed for 90 days. It even has a general hospital in it. It has oxygen. For the purposes of power there is even being considered the possibility of a nuclear reactor. It is a study, and it goes beyond, of course, the current planning in the nearer surface structures.

Mr. MINSHALL. As far as shelter standards go, this would be pretty much a gold-plated job then, would it not, strictly de luxe?

Mr. BENJAMIN TAYLOR. It would approach absolute protection, which, of course, you can never guarantee. At the present time we are having a study made as to the effect of large surface burst weapons on such a structure, because the Panero study does not include this in detail. We are having a study made to determine what the possible effect, first of a 20-megaton weapon, would be, exploded on the surface. We would not expect this size weapon to have any serious effect. The main effect might be the spalling of roof areas. Then from the preliminary study we might determine what size weapon it would require to do heavy damage, 100, 200, 500 megatons, whatever it might be.

Mr. MINSHALL. This shelter you said would be good for 90 days, imagining that one of these bombs would hit New York, with all of the rubble and everything else, it would probably be the second generation that would dig out of the shelter.

Mr. BENJAMIN TAYLOR. No, the ultimate would be interconnection between the boroughs, so there could actually be migration. There are so many angles to this study, I cannot attempt to give them all here.

Mr. MINSHALL. It is an expensive angle, I see that.

Mr. BENJAMIN TAYLOR. Actually, as people enter this shelter, they could migrate to their home boroughs through the interconnected

system of tunnels. If you worked in New York and lived in Brooklyn, you could enter the shelter and with proper organization in time migrate back to your home borough.

Mr. MINSHALL. In other words, we are going to be competing with the moles.

Mr. BENJAMIN TAYLOR. This would be a similar proposition.

Mr. FASCELL. You could get the study to where it starts making money again.

Mr. BENJAMIN TAYLOR. Of course we are also interested in possible dual-purpose usages. We have considered it as a possibility for throughways, or maybe for storage, or some specific industries. There are many considerations. As I say, this is a rather interesting and bold concept that has gone beyond the normal shelter planning and I cannot say that it is ready today to be spread over the Nation, but it is something to think about.

Mr. MINSHALL. How long would it take to construct something like that, assuming you could collect enough money?

Mr. BENJAMIN TAYLOR. This will be in the report. I do not have a construction schedule at hand, but you could work it from any angle you wanted to and the time for construction would depend on what your schedule was.

Mr. MINSHALL. You certainly could not do it in a month. It would take a number of years, would it not, 10 or 20 years at least?

Mr. BENJAMIN TAYLOR. I would not say that. I do not see why it could not be done in a matter of a few years, not 20 years.

Mr. MINSHALL. What is "a few years"?

Mr. BENJAMIN TAYLOR. I would not want to commit myself on that because it depends on whether you are talking about the island of Manhattan or the whole city, or what?

Mr. MINSHALL. Greater Manhattan, Greater New York.

Mr. BENJAMIN TAYLOR. This would be a tremendous project, it is true, and it would take several years certainly, depending primarily on how many points you started work at and how many conveyor tunnels you had to take the rock out, and so on.

Mr. MINSHALL. What is your best estimate in years other than using the word "few"?

Mr. BENJAMIN TAYLOR. I do not think it is fair to give an estimate on this. You could say it could be done in 2 or 3 years if you put enough effort into it.

Mr. MINSHALL. Do you really think it could be done in 2 or 3 years?

Mr. BENJAMIN TAYLOR. If the emergency required that degree of effort. It certainly would not be done in a year or two.

Mr. HOLIFIELD. I want to ask in all seriousness—

Mr. MINSHALL. I was serious, Mr. Chairman.

Mr. HOLIFIELD. I know you are and I am, too. I ask why you indulge in such a fantastic study when the problem faces the Nation of giving protection to the maximum number of people? The only thing that I can see that such a study as this would bring about is such a completely fantastic picture, such a fantastic story that it could be used to ridicule the whole proposition of giving the people of this Nation a reasonably attainable and safe type of shelter which would not even begin to approach such a fantastic cost per person.

Mr. BENJAMIN TAYLOR. Let me tell you how we got into this.

Mr. HOLIFIELD. And how much you have spent on it.

Mr. BENJAMIN TAYLOR. We have spent only \$18,000. We have gotten a tremendous wealth of information for this amount of money which will add greatly to knowledge of shelter construction, whether it is this or other types. The way we got into this, the idea was conceived of by the Rand Corp. and they had some initial studies performed by Guy B. Panero. We have had conferences with the Rand Corp. and, as a result of our conferences, we felt it was something that should not be just let drop but that it should be continued to its conclusion because the cost was so small and the possible knowledge that might come out of it, including the geological knowledge under our big cities, was worth many, many times the money put into it.

Mr. HOLIFIELD. I am not going to pass judgment upon the worth of the knowledge you obtained by spending \$18,000 in this particular field because there is no doubt that you did get some geological knowledge out of it, but when you apply this to a fantastic system of shelters underneath one large city, all that I can see that you can do is to give to the newspapers a motif for ridiculing and discouraging the whole consideration of shelter. It is obvious that we are not going to go 600 or 800 feet under the city of Manhattan and take care of the people of Manhattan with money which could be spread out over the whole country and take care of people that are just as valuable as the people that live in Manhattan. You could spread it out for 8 or 10 times as many people as you could spending the same amount of money on the city of Manhattan.

Mr. BENJAMIN TAYLOR. May I make it clear, Mr. Holifield, we are not recommending this at this time. This is simply a study.

Mr. GALLAGHER. Speaking to the general point, Mr. Chairman, we feel we must look at numbers of things which have no indication as to eventual policy or practical program. The figure of \$680 per person here might recommend itself some time in the future, if you want an optimum degree of protection.

I think it has no bearing on what present policy ought to be at this time, and what you say is perfectly true.

Mr. HOLIFIELD. Well, I am glad to hear you say that because there are a great many people in the world that do not believe there is such a thing as a hydrogen bomb.

There are a great many people who do not believe that 150 megaton-range weapons can spread radioactive fallout over this country that will kill 150 million people, right in the United States. These are scientific estimates. They are not my speculation. It is obvious that if that type of a hazard does exist and we are spending \$40 billion a year in order to maintain this kind of a hazard for other people and to defend ourselves from this kind of hazard in our own country, some serious thought should be given to a reasonable type of shelter. If it is nothing else than a radioactive shelter, it is better than the type of shelter the American people have today.

There is no way that I know of that is better to kill serious consideration of an economically and technically feasible shelter program than to bring forth some fantastic scheme such as this, which can be used to discredit the objective of obtaining the maximum protection for the maximum number of people within the economic feasibility of the Nation.

Mr. BENJAMIN TAYLOR. May I simply say this, Mr. Holifield: We are not recommending this. We are not advocating it.

Mr. HOLIFIELD. This is the sort of thing a newspaper writer will pick up and say FCDA presents program for 800-foot deep shelters under Manhattan and at a cost of \$40 billion or something like that.

Mr. BENJAMIN TAYLOR. Let me say for the record then that the FCDA is not presenting this program in any form; it is simply a study and the only reason for bringing it to your attention this morning was that we wanted you to first hear about it from us and not from someone else.

Mr. FASCELL. Well, may I say something on the record, Mr. Chairman?

Mr. HOLIFIELD. Surely.

Mr. FASCELL. I would certainly hope that no study of any kind on a matter as serious as this would be used to discredit any part of what we are trying today to do and I do not think it would be. If it is done that way, it would be childish.

I, for one, would like to go on record surely as saying I am glad you have gone outside the bounds of conventional thinking in order to arrive at facts. Particularly if you have done it with a reasonable part of your budget compared to the total cost. I can visualize the necessity of industry going underground and these studies might present the facts which would make it feasible and economic for industry to do it. You have to start some place, because we are not going to get all industry protected at one time. These very facts might make it possible for some industry to not only disperse itself strategically, but get protection which it needs for its operation and people on the ground.

Mr. BENJAMIN TAYLOR. You see very little was known about this and when the idea was first broached, the thinking was it would cost several thousand dollars per person, which would be tremendously prohibitive, but only by going into the details was it discovered that such shelter is not as expensive as offhand you would assume.

Mr. FASCELL. And further studies might indicate you could bring the cost down to where it might be economical.

Mr. BENJAMIN TAYLOR. Yes, indeed. One thing is true, if you do not start now, you are not going to find out 10 years from now. We feel it is worthwhile data to get and we feel it may have other applications. In Detroit, for example, there are tremendous areas of a salt mine, I think it is something like several million square feet, already excavated right under the city. Under the New York Central yards, down 1,100 feet, are these huge excavated areas which would be adaptable to this sort of thing.

Mrs. GRIFFITHS. Mr. Chairman, since I am from Detroit, have you estimated the cost of such adaptation in Detroit?

Mr. BENJAMIN TAYLOR. No, we have not. We were a little disturbed to hear that the city of Detroit was thinking of using some of these areas for garbage disposal, just sealing up the garbage down there. We hope that does not happen, not that we have any immediate plans for the area, but it seems a shame to do it, Mrs. Griffiths.

Mrs. GRIFFITHS. I would like to ask another question about that. How many speeches have you made to the general public recommending underground shelters?

Mr. BENJAMIN TAYLOR. About this type of shelter, none, Mrs. Griffiths.

Mrs. GRIFFITHS. Any type of underground shelter.

Mr. BENJAMIN TAYLOR. Do you mean the agency?

Mrs. GRIFFITHS. You or any person here.

Mr. BENJAMIN TAYLOR. That would be a rough guess. I would not know how to estimate it. It has been talked about so many times by people in the agency, if we attempted to count them it would run into several hundred, would it not, Mr. Gallagher?

Mr. GALLAGHER. This is a continuous process.

Mrs. GRIFFITHS. In making these speeches, I would like to ask this: I am sure it is not secret information—what kind of reaction do you get from the public?

Mr. BENJAMIN TAYLOR. Sometimes a speaker might think this is a discouraging aspect of civil defense. We are working in a tough field, you know. At the time of the meeting we often get very favorable reactions. We feel that we have really convinced people of the need, but of course then, we get into the financing and this is always the stumbling block.

Mrs. GRIFFITHS. To whom are you speaking when you get a favorable reaction?

Mr. BENJAMIN TAYLOR. I am speaking of various audiences of the general public, State civil defense people and general public.

Mrs. GRIFFITHS. I have made these speeches repeatedly and I have never gotten a good response from anybody. They resent the idea of having to go underground. I think you need to do a real good selling job on the necessity, and you are not doing it.

Mr. BENJAMIN TAYLOR. Well, my understanding is that this effort is to be intensified, the public education part of it. We take it up with technical groups mainly.

Mrs. GRIFFITHS. That is what I thought. You are not talking with the general public on these things. You are talking with people who have some understanding to start with.

Mr. BENJAMIN TAYLOR. Yes, mostly.

Mrs. GRIFFITHS. And who are willing to listen to scientific information.

Now, I would like to ask you, if you are trying to make a plan for Manhattan where you are going underground 1,100 feet, and Detroit is one of the major cities on earth to whom this is really available right now, why are you not talking to the officials in Detroit on this matter?

Mr. BENJAMIN TAYLOR. Mrs. Griffiths, this is not a plan for construction. We are simply carrying on a study that had been started and seemed very worthwhile for the sake of gaining a lot of knowledge, and the same principles which evolve from this would be applicable to Detroit and many other cities.

We are not completing a plan and recommending construction of it or anything like that, and the information that is obtained from this study would be applicable in Detroit, Chicago, and many other cities.

Mrs. GRIFFITHS. But it would be more applicable in Detroit. It would be done much cheaper in Detroit, would it not?

Mr. BENJAMIN TAYLOR. Except that we had this particular rock situation in New York. The study was started there. We did not

start the study. We simply saw to it that it was completed and we got the maximum benefit from it.

Mr. GALLAGHER. Actually it was started on the basis of someone saying New York City is the most difficult situation so they decided to see what they could do with New York.

Mr. LIPSCOMB. What do you mean that you are carrying on the study? Are you still working on it?

Mr. BENJAMIN TAYLOR. It is essentially complete now. We have almost all of the report.

Mr. LIPSCOMB. Well, how many people on your staff were working on the study?

Mr. BENJAMIN TAYLOR. On our staff we had 1 or 2 people working continually with the organization of the Guy B. Panero Co., but this is a contract study. Very little of our time has been put on it.

Mr. LIPSCOMB. Well, what Mr. Gallagher said at the start, your studies on shelter have been limited to the extent of staff and funds, and I personally believe you need a bold, imaginative, practical, study of shelters, so that we can get going.

I have to concur with the chairman in regard to his opinion.

Mr. MINSHALL. Mrs. Griffiths, will you yield a minute, please?

Mrs. GRIFFITHS. Yes.

Mr. MINSHALL. Along the line of questioning Mrs. Griffiths asked about the selling job that you are doing on this shelter construction program, it might interest you to know that a year ago I took an opinion poll in my district which is a suburban area of the city of Cleveland, and the results to that opinion poll showed that the people were opposed to any air-raid shelter construction program by about a 4 or 5 to 1 vote.

I asked the same question this year and precisely the same language was used. The results of that poll I am going to announce next week, but on this 1 question you actually lose 2 or 3 percentage points. People are more against it this year than they were a year ago.

Mr. FASCELL. Nobody has dropped a bomb in the meantime.

Mr. MINSHALL. Somebody had better do this or do something if you want to sell this program.

Mr. BENJAMIN TAYLOR. We are selling shelter generally, not a specific program, because as Mr. Gallagher said, the guidance we expect will be forthcoming. As an organization, the Federal Civil Defense Administration is not in a position to establish a national program.

Mr. MINSHALL. My question was to the shelter program. Would you be in favor of a \$20 billion civil-defense air-raid shelter program?

Mr. BENJAMIN TAYLOR. Well, I think the hope is in everyone's heart, and they like to look at it this way, that this catastrophe will never happen and it is one of the tough problems of civil defense.

Mrs. GRIFFITHS. I would like to say, too, that I agree with the chairman, that you really endanger the whole program.

I hate to criticize you, but I just think you are not putting these facts out and I do not think this administration is telling what it really knows must be the truth. If they expect to protect the people of this country, it is time to speak up and tell them the hard, cruel facts.

Mr. BENJAMIN TAYLOR. Well, of course, you appreciate that I cannot speak for the administration and all of this whole problem is wrapped up with many other facets of total defense. We go ahead with our planning and our design so that we may be prepared to meet whatever is required.

Mr. HOLIFIELD. Well, I have been very much impressed with the general presentation here this morning of the different types of shelters that were tested out in Nevada and I am hoping that when we get to the cost studies by one of your witnesses later on that we will have some additional practical information given us there.

I could not resist saying that I think that this type of study is far-fetched in the face of the practical need of the country. Of course, I realize that your agency cannot form basic policy. I realize that. I am not going to criticize your agency from the standpoint of the formation of policy, but you are subject to policy decisions which are made above you.

Now, as to whether criticism should be made about that or not, I have some very strong ideas, of course, and I will make them at the proper time. Did you have further presentation?

Mr. BENJAMIN TAYLOR. No, I think that just about concludes it.

Mr. HOLIFIELD. Mr. Roback has some questions.

Mr. ROBACK. Mr. Taylor, you mentioned the Sandia Corporation, did you?

Mr. BENJAMIN TAYLOR. The Rand Corp.

Mr. ROBACK. Excuse me. Have they made a study now, a shelter study?

Mr. BENJAMIN TAYLOR. No, they are doing a study on civil defense, I understand.

Do you know any more about that, Mr. Gallagher, particularly as to when it might be ready? Do you want to say anything about that?

Mr. ROBACK. Do you know under whose auspices the study is being conducted?

Mr. GALLAGHER. Rand will speak for themselves but they have been making a study which they do from time to time in the public interest on the requirements for a nonmilitary defense system.

Mr. ROBACK. Is that study under contract with the Air Force?

Mr. GALLAGHER. No, they do that with their own funds. They pick up these particular studies. This is not an Air Force study.

Mr. ROBACK. Kind of a poor man's Rockefeller study. Mr. Taylor, your reference to these designs of structures, and the following discussion, was in the context of a position by FCDA that you will furnish design information, but you do not study the administrative planning construction requirements of a nationwide shelter system. You do not concede that that is a function or duty of the FCDA?

Mr. BENJAMIN TAYLOR. We have done that, yes, and this was the basis, of course, to a certain extent for the program recommended.

Mr. ROBACK. Well, what is the basis for the financing? What is the financial premise? Suppose it was a matter of law that there be a Federal shelter program. Would the FCDA be prepared? Are they now in a position of planning out the requirements for such a program, how the financing would be handled, how the planning would be done?

Mr. BENJAMIN TAYLOR. Well, we are in a position to make recommendations on it. We have given it considerable thought and study.

Mr. ROBACK. Well, my question goes to the specific question of the premise. Are you studying shelters on the premise that the Federal Government will not construct them or that they will, or does it make any difference to you?

Mr. BENJAMIN TAYLOR. You are speaking of financing now?

Mr. ROBACK. Well, it is obvious if you do not have Federal financing, you do not have to worry about how the Federal Government lays out the program. That will be up to the financing interests of the various local communities.

Mr. BENJAMIN TAYLOR. Except that we would give them technical guidance in any event.

Mr. ROBACK. That is different from planning a program.

Mr. BENJAMIN TAYLOR. Well, we have long felt, of course, that it is going to be very difficult, regardless of what type of educational program you put on, to get an adequate shelter program with simply private capital. I think perhaps you will all agree how difficult this would be within any reasonable length of time, so that we do foresee that if this is to be accomplished in a reasonable length of time it would probably require Federal assistance.

Mr. ROBACK. Well, are you prosecuting any studies on that premise?

In other words, if the Congress in its wisdom decided to support such a program, would the FCDA say, "Well, we have the information or we can develop it rapidly. We are working in this field?"

Mr. BENJAMIN TAYLOR. Are you asking, for example, what our recommendation would be as to the percentage contribution by the Federal Government, something along that line?

Mr. ROBACK. Well, that is why I asked you. What is the financing premise? Suppose the Federal Government decided that it was a hundred percent Federal money that went into a national shelter program? Now, that means that an agency of the Federal Government would have to plan and possibly construct a shelter program.

Are you prosecuting any studies that would enable your agency to direct such a program?

Mr. BENJAMIN TAYLOR. We have made some such studies, yes. Would you like to say anything more about this, Mr. Gallagher?

Mr. GALLAGHER. We have made such studies, as Mr. Taylor has said. You are talking about the mechanism required for administration of a shelter program, a large national shelter program?

Mr. ROBACK. Yes.

Mr. GALLAGHER. We have looked at the program, Mr. Roback, and we have specific recommendations to make if such a thing came to pass. More study needs to be carried on in this area, but we have made initial studies; yes.

Mr. ROBACK. Is that the initial study that was embodied in your presentation to the administration?

Mr. GALLAGHER. At that time we did not speak to the point of administration of such a program; no, sir. It could be done in a variety of ways, by utilizing the normal construction agencies of Government or by the establishment of an overall shelter authority. We have looked at the problem, that is about all.

Mr. HOLIFIELD. Further questions of Mr. Taylor?

Thank you, Mr. Taylor, for your presentation. I am assuming that you have on your list here Dr. William White of the Stanford Research Institute who will give us some benefit of the cost study later on. I have not gone into cost with Mr. Taylor because I believe that is coming later.

Mr. GALLAGHER. I believe Dr. White is prepared to talk about the cost.

Dr. WHITE. I am here, and what we will say depends upon the classification of the study, Mr. Gallagher.

Mr. HOLIFIELD. If you are coming to that later, then I will not pursue the point.

Mr. BENJAMIN TAYLOR. Well, I will be here if you want to ask me about costs at any time.

Mr. HOLIFIELD. All right, Mr. Taylor.

The next witness then.

(The testimony of Dr. Nathan Newmark, which was received on May 1, 1958, is as follows:)

Dr. Newmark is from the University of Illinois. He is here with the FCDA representatives and Mr. Gallagher has asked that he be put on because he has to get to Connecticut.

STATEMENT OF DR. M. NATHAN NEWMARK, UNIVERSITY OF ILLINOIS

Dr. NEWMARK. I am head of the Department of Civil Engineering at the University of Illinois. I have been a faculty member there since 1934 and I have been associated with structural research work during my career at the university and have been in charge of the structural research laboratory at the university. My interests have been in dynamic behavior of structures, including such things as impact on bridges, wave action on offshore structures, earthquake effects on structures, and effects of bombs and explosions.

I have been engaged in this latter work since about March 1940, when I became a consultant to the Committee on Fortification Design of the Office of Scientific Research and Development, and also a consultant to Division II of NDRC, which was associated with this sort of work during the war.

I have been associated with all of the weapons effects tests, beginning prior to Operation Greenhouse in 1951 either as a consultant to one or more of the Government agencies or as director of a project which our laboratory at the university has had responsibility for.

This statement is concerned primarily with a review of the present state of knowledge concerning structural design of shelters to resist nuclear blast. I would like to make it clear at the outset that engineers are accustomed to the problem of preparing a design, whether available knowledge is adequate or not.

In those instances where sufficient information is not available and cannot be obtained, then the engineer must draw on his judgment and experience to guide him to a practical solution. He cannot throw up his hands and say that the problem has no solution.

However, in such cases he must pay the penalty of an increased conservatism in his design with a consequent increase in cost. The-

problem is, therefore, not whether we know enough now to design shelters for protection against nuclear blast, but whether we have sufficient knowledge to design such shelters most economically.

A protective shelter is intended to protect its occupants from the various hazards associated with nuclear weapons, including initial radiation, heat, blast and shock forces, and fallout radiation. It must also provide means of access or entrance and exit in times consistent with the requirements of warning, number of occupants, and similar factors.

To avoid misunderstanding, it must be made very clear at the outset that there is no absolute protection against a nuclear blast. Even if one were to design structures for an overpressure of even a thousand pounds per square inch at a cost of several hundreds of billions of dollars there would still be some casualties and in some cases there could be a very large number.

However, for any of the several levels of protection short of absolute safety, structures can be designed to resist all of the forces or other effects arising from the detonation of nuclear weapons. The cost of such protection varies with the level of safety provided.

Radiation attenuation requirements impose conditions on the structure which are related to those imposed by the requirement of necessary strength to resist blast forces. Thicknesses of walls or of earth cover sufficient to reduce intensities of radiation to tolerable levels, with the addition of appropriate reinforcing or strengthening members, can usually be made sufficient to provide structural protection against the blast forces also. Conversely, the addition of a few feet of earth cover may make an adequate structural design sufficiently resistant to radiation as well. Particular attention must be given to the geometry of entranceways.

Various degrees of or levels of protection are possible ranging from protection against fallout radiation only, through blast protection in fringe areas of the order of 30 pounds per square inch or less, and moderate blast protection up to 100 or 200 pounds per square inch, up to high-order protection of the magnitude of 1,000 pounds per square inch or more.

Each level implies somewhat different requirements for the structure. Each also involves a certain probability of success or of failure to perform its function. In other words, a structure which is intended to furnish resistance only up to a 30 pound per square inch overpressure will be adequate only beyond about 3 miles from the point of burst of a 20-megaton nuclear weapon—and I have used this as an example rather than 1 megaton, which I regard as much too small to talk about—and one designed to resist overpressures only up to 100 pounds per square inch would not be adequate closer than about 1.8 miles from ground zero.

The latter figure would be about 0.9 miles for 800 pounds per square inch, incidentally.

Similarly, a fallout shelter designed to be adequate for an intensity of radiation that may be expected over large areas may be inadequate for a certain smaller area where there may occur an extremely high level of radiation in the vicinity of the particular shelter.

In general, blast resistance is a function of strength and radiation resistance a function of thickness and the geometry of entrances and

openings. The two are not necessarily synonymous but they are related.

In structures designed to provide relatively high levels of protection, particular attention must be paid to the means of access. Entrances, doorways, vents, and other openings into the structure are sources of weakness which must be adequately strengthened to resist the blast forces that the remainder of the structure is designed for, and properly designed geometrically to reduce radiation penetration. If it were not for the problem of entranceways, overpressure levels of protection could range as high as several thousand pounds per square inch.

Shelters may be aboveground, partly buried with earth, or completely below ground level. The structures themselves may be made of various materials and may be framed in various ways. However, we can distinguish between two major different types of structural action, in (1) rectangular structures and in (2) arched or domed structures, whether these are above or below ground.

It is difficult to provide blast protection in rectangular structures aboveground even at overpressure levels as high as 30 pounds per square inch. The magnitude of the reflected blast pressures and the necessary thicknesses of materials to resist the blast forces in bending, make aboveground rectangular structures relatively uneconomical even for moderate overpressures. Rounded structures either arched or domed in shape have inherently a higher resistance, and because of their shape impose a smaller loading on the structural parts when used aboveground.

Consequently, such structures can be designed to resist adequately overpressures possibly as high as 50 pounds per square inch and perhaps even higher. The end walls in arched structures provide some difficulties in design but these difficulties are not insuperable. Domed or arched structures built at ground level, but with earth heaped against their sloping sides to give them a further rounding or streamlining, are even more resistant and may provide adequate blast protection up to overpressure levels as high as 100 pounds per square inch or even more.

Mr. HOLIFIELD. There is no reason why a rectangular structure could not have an arched end wall.

Dr. NEWMARK. That is correct. The structure could be rectangular with an arched cover and domed end wall but the end wall would still be a possible source of weakness at the junction between the cylinder and the dome. This can be designed. It provides some difficulties.

However, because of the effect of the earth in reducing the loading on the structures buried in it, it is possible to resist extremely high pressures with either rectangular structures or with arched or domed structures completely underground, with a much smaller degree of structural resistance for a given overpressure.

In order to be adequate, a rectangular structure requires more cover of earth over the top than does an arched or domed structure, even in these circumstances. However, it is not impossible to resist overpressures of the order of 500 pounds per square inch with a concrete arch of the order of a 30-foot span and a thickness of about 2 feet, provided that a cover of earth of the order of 5 to 10 feet is available over the crown.

Thin steel or structural plastic shelters with sufficient earth cover can be used underground but would be completely inadequate above-ground.

At first thought, the use of multipurpose shelters appears to be an attractive means for reducing cost. I speak here of blast shelters. However, many problems are involved in using structures for shelters which normally are used for other purposes. Use of tunnels involves major problems in control of traffic and in access of large groups of people. Use of underground garages is attractive if such garages are designed initially for the higher overpressures. However, economical limits for even such structures as underground garages appear to be somewhere in the range of the 50 pounds per square inch overpressure level.

Beyond that point, the cost of the shelter aspects of the structure far outweigh the cost of the ordinary use aspects, and the problem of blocking off or sealing off the large entrances against high blast intensities becomes extremely difficult. However, for fallout protection such multipurpose shelters are extremely attractive.

The problem of structural design for dynamic loading such as that arising from blast is similar to many other problems in the design of structures. It involves the selection of size and shape as well as dimensions of the parts of the structure. The design is based on fundamental relationships which can be derived theoretically or experimentally and depends on information of various kinds, including the type and magnitude of loading, the properties of the structural materials, the fabricating techniques, the details of construction, and even the possible errors in preparing the materials or fabricating the elements. One must make allowance for all of these factors.

There are many factors in design which are not accurately defined or which are not even accurately definable. For example, one cannot predict the precise nature or magnitude of blast loading with a margin of error smaller than 20 to 25 percent, in general, even if the weapon yield and point of detonation are known in advance.

Moreover, one cannot predict what the precise resistance parameters will be of a structure which has not already been built and tested within a margin of error of only slightly smaller magnitude.

This means each individual structure, not one of a class.

Allowance must be made for these factors, at least in a reasonable way, although it is not necessary nor desirable to take each source of error at its most unfavorable range.

Again, it should be pointed out that these sources of uncertainty are common in all structural design, that nuclear blast loading does not present a marked difference except in terms of the magnitude of loading which must be considered, and that there are procedures either available now or under study which can lead to reasonable solutions to the problems.

Nevertheless, it is still true that for protective structures, some of the uncertainties are of a major nature still. This arises from the fact that in most instances in the past in the consideration of structural design problems we have been concerned with ranges in the behavior of the structure short of failure. It is only in the past 10 to 20 years that engineers have concentrated their attention on failure conditions.

Consequently, our knowledge of the behavior of structures in the range approaching collapse is not as great as our knowledge of structural behavior in the elastic range where there is no permanent deformation. Moreover, our knowledge of extremely highly resistant structures is not as great as our knowledge of resistance of structures of ordinary strength.

As in any other problem in structural design, there are three principal procedures for the development of the necessary knowledge to prepare a protective design. These involve in general theoretical studies, experimental studies in the laboratory, and the interpretation and observation of experience. In the nuclear area the latter is primarily concerned with nuclear field tests as there is no other major source of experience. These three methods of approach are not in general alternative procedures with the same objective.

In some cases, one method is preferable to the others either in terms of cost or in reliability. However, in most instances a good theoretical basis for the problem helps to understand the laboratory experimental program and both of these are necessary in interpreting the field test data.

Similarly, laboratory tests and field tests may be needed to furnish empirical factors or parameters to be used with the theoretical studies. Each type of approach supplements the others.

Field test programs or engineering observations are most successful when they are devoted to the obtaining of fundamental engineering information rather than toward the gathering of data on the performance as "proof tests" of particular structures. This is the case because of the fact that all aspects of the proof-test structure are not easily reproduced, and, above all, no means exist for giving information on all of the possible configurations and aspects of a possible attack including potential sizes of weapons.

The fact that a structure falls down in a field test does not necessarily indicate how much strengthening is required for it to stand up, and the fact that it stands up does not give a sufficient indication of its margin of safety or of its overconservatism in design.

In many instances, field tests can be very misleading unless they are related either to theoretical studies or to laboratory tests or, preferably, both.

Information obtained from the small nuclear weapons field tests in Nevada on failure of shelters may overestimate severalfold the overpressure which would cause failure of such shelters under the action of the megaton range weapons such as are tested in the Pacific. This is primarily due to the longer duration of the loading under the higher yield weapons.

I have been trying to make the point clear that we cannot just take the data from the operations in Nevada and apply it to design directly. There must be a lot of intermediate steps involving theoretical studies, experience and structural knowledge that is combined with this.

Although the problem of design against nuclear blast forces presents somewhat unusual conditions to the structural designer, it is not unrelated to other problems with which he has been concerned for some time. The designing of a building to resist earthquake forces, the design of buried pipes and culverts to resist highway and railroad loads, the design of foundations for massive structures, the effects of

impact and wind forces on bridges, the effects of wave action on offshore structures, all present similar or related problems. Many aspects of the design of structural joints and connections are pertinent to the problem as well.

Fundamental studies of the strength and behavior of reinforced concrete in compression and bending supply information which is directly useful. These points are made here to indicate that fundamental engineering studies and investigations of various types support our knowledge and capability in the protective structure problem.

Regarding status of present knowledge, for moderate levels of overpressure ranging up to 30 pounds per square inch, present knowledge is adequate to permit design of conventional types of shelters. However, it is possible that more ingenious methods of design and construction can be found with further study. In the range of overpressures from 30 to perhaps 200 pounds per square inch the uncertainties are greater, and the extent of conservation needed in present design procedures is consequently greater.

In this range, the uncertainties concerning aboveground or partly buried structures are of a major nature, and those for underground structures are somewhat less, even though they are still large.

Finally, in the range from several hundred pounds per square inch upward, much greater uncertainties exist, and even for underground structures overdesign is necessary until further basic information becomes available.

It is desirable to point out that several topics need extensive additional study. The most important of these are: (1) Means of providing entrance facilities; (2) reliable measures of cost for shelters in congested areas. Further knowledge on these points coupled with further fundamental engineering investigations of basic problems can lead to major increases in economy in shelter design. The situation concerning some of these topics will be discussed in greater detail.

Blast and shock loadings on structures are still subject to major degrees of uncertainty. The greatest uncertainties exist for structures below ground. It should be pointed out that the same uncertainties exist for ordinary construction of tunnels and other elements under a large cover of earth. The magnitude of the forces acting on the structure depend on the relative strengths and stiffnesses of the structure and the surrounding soil or rock, and a great deal of engineering study is necessary to give an adequate solution to the problem of loading. Similar uncertainties exist for partly buried structures and for above-ground structures.

Uncertainties in the properties of materials are not large now, but still there are factors which require further study. The influence of dynamic or high-speed loading on yielding and strength of materials is a fundamental scientific problem which has been under study for some time. The influence of the ordinary imperfections and discontinuities on these characteristics of the material has not been adequately studied. The strength of concrete and of steel under high-speed loading has been studied to some extent, but uncertainties still exist in the strength characteristics of members designed for high levels of strength.

Because it is uneconomical to design for elastic conditions in protective structures where high overpressures are to be considered, the structural designer must take into account absorption of energy in

the "plastic" range of action of the material and of the structure. Detailed knowledge of the circumstances under which such plastic absorption of energy is possible without leading to brittle fracture is not available, although a good deal of information is at hand. Of particular importance are the effects of local imperfections, discontinuities, extreme temperatures, and other factors on tendencies to brittle fracture of high-strength materials and alloys.

Even for ordinary structures, the cost of the foundation or footings of the structure is a large part of the total cost. For certain types of protective structures, estimates that have been made indicate that the foundation cost may be as much as, or even more than, half of the total structural cost.

Little or no information is available on the dynamic behavior of footings, piles, or other foundation elements to support structures either above ground, partly buried, or below ground. Major savings in cost of construction and design can be achieved with further information on the dynamic strength of foundations.

Perhaps the most important uncertainty in shelter design is the matter of design of entrances and accessways. Both the structural design of these and the number and size required are topics about which there is a scarcity of data. Ramps or passageways descending from the surface produce very large increases in pressure because of the reflection of the shock wave as it travels across the opening. Means exist of reducing the intensity of the shock by changing the configuration, but these may introduce complications in the opening and closing procedures of the doorways.

Both design studies and fundamental studies of different types of accessways are required to solve the problem adequately.

Problems concerning ventilation and ducts and other appurtenances have been under study but more information is needed. Similar unstudied problems are concerned with the effect of ground water and the local water table and its effect on underground structures. Adequate means of waterproofing and an assurance of continued waterproofing, after a shelter has been subjected to blast forces, present problems which have not been adequately solved.

Various military agencies and the Federal Civil Defense Administration have been concerned with the problems of protective structures, and a great many studies have been completed or are underway. The fact that uncertainties and problems still exist should not be taken in any way as a criticism of the effort that has been expended or that which is planned. The problem is a major one, more complex than most structural engineering problems which we have faced in the past.

It is not unreasonable to compare the nature and extent of our present knowledge of protective construction with our present knowledge of highway structural design. The design of highway pavements is still subject to uncertainties and complexities which have not been completely solved. A great deal of effort has been expended in the solution of these problems, but a great deal more must be spent on the highway pavement problem and the highway bridge design problem in the future.

Mr. HOLIFIELD. That does not necessarily mean that we do not build highways?

Dr. NEWMARK. No, but they cost more than they might otherwise cost.

Mr. HOLIFIELD. That is probably true.

Dr. NEWMARK. And we do spend a lot of money on research in these problems.

Mr. HOLIFIELD. What you do say is, we never come to an end of human knowledge about any one subject and while more is desirable, that does not necessarily indicate that action should not be had in any field where there is a further field of knowledge to be explored.

Dr. NEWMARK. Right.

It is in the nature of a difficult engineering problem that no quick or easy solution is possible. Studies are required over a long period of time by a great many people and difficulties and inconsistencies must be resolved.

In many respects our knowledge of the problem of protective construction is nearly as good as our knowledge of the highway structural problem, in spite of the fact that our concern with the protective structural problem has been of a much shorter duration.

I made this comparison to put the thing in its proper perspective. We do know a lot about protective structures, though this has been a matter of concern for perhaps only 15 years.

Mr. HOLIFIELD. Well, we have had the problem of underground structures in our skyscrapers—that is, the underground footings and the overpressures from masses of earth in our mines and the footings on the island of Manhattan, for instance. We have had a great deal of knowledge of underground footings which are subject to great pressures of weight. In the case of building some of the high buildings in New York, for instance, that problem of providing foundations for the great buildings that we have there has been a matter of—

Dr. NEWMARK. Those are generally founded on piles or caissons to rock. There is not the same kind of uncertainty and there is a difference in the static problem compared with the dynamic problem, and, furthermore, I think the most important thing is that our factor of safety for the design of such elements is very large. Much larger than we can afford to provide in the protective structure problem. Something of the order of maybe five or more.

There are several requirements for a sound program of study of the protective structure problem. Such studies must be supported by adequate funds and involve competent engineering groups. Although our present knowledge is adequate to permit us to make the necessary designs for protective structures now, the decrease in conservatism that would be possible with additional knowledge would repay many times the cost of the additional work required to increase our knowledge of some of the factors of uncertainty which still remain.

The requirements of a sound program which are regarded as of most importance are the following: (1) Concentration on basic engineering knowledge; (2) support of fundamental engineering investigation; (3) support of design studies including imaginative and unusual design concepts; and (4) free exchange and criticism among professional engineers of the ideas developed both in design and in theory.

Structural design is a part of civil engineering. Current emphasis in support of research and educational programs in other branches

of engineering and science has led to a reduction in the relative support of civil engineering research.

Consequently, the source for increases in our basic engineering knowledge is not adequate. Over the country, in all universities, civil engineering departments have not obtained new laboratories and new equipment and have not been able to carry on work of the nature and scope necessary to solve many of the fundamental problems of structural engineering including the protective structure problem, or the highway pavement and highway bridge design problems, and other problems as well.

In spite of the fact that the construction industry is the largest single industry in the country, support of the educational institutions which contribute to the fields of design and construction is less proportionately, both from private sources and from governmental agencies, than support for activities in mechanical engineering, electrical engineering, aeronautical engineering, and the fundamental sciences.

Because of a lack of adequate laboratory space and equipment, many worthwhile programs relating to protective construction which have been considered by various groups cannot possibly be carried out unless the Federal Government can find ways of supporting construction of permanent research facilities in this field at educational institutions.

It is important also to develop and to carry to the point of having actual drawings prepared, the design of protective structures of a number of types including unusual and imaginative solutions of the problem. Some of these are already available and some have been tested by actual exposure to nuclear blast conditions. However, much more needs to be done in order to insure the development of the most economical types for various circumstances, and in order to clarify some of the fundamental problems so that further fundamental engineering studies can be dedicated to the appropriate ends.

Finally, progress in the development of adequate design concepts cannot be obtained without a free exchange and criticism of ideas among the engineering fraternity. Security classification of research programs in structural mechanics inhibits the necessary evaluation of ideas. It is particularly important in the proper evaluation of the new and unusual concepts that they be freely distributed and available for study and discussion. Otherwise, the situation may become similar to that which existed in another field in structural design some years ago, in the development of floor slabs for buildings. In this instance a particular type of floor construction was promoted to such an extent that it received an unreasonably and unduly favored treatment in building codes, which exists to some extent even to the present day, and which hinders the development of other equally favorable or possibly more favorable types of construction. This sort of thing cannot be permitted to happen in the field of protective construction.

That concludes my formal testimony, Mr. Chairman.

Mr. HOLIFIELD. Thank you, Dr. Newmark.

As I have listened to your testimony all the way through, it appears to be the same type testimony which we have been receiving continuously from professional men and I am not criticizing the fact that this is the type. It is testimony which is conservative and which

asks for more research and study and more support of educational institutions and it points out the fact that everything is not known in the particular field.

Of course, all of these things are well based from the standpoint of a scientist or an engineer, but it does not seem to take into consideration in any degree the urgency or the need for protection in the conditions of the world that we live in today, if I read your testimony right.

It advocates delay until you finally find out these programs, if I read it right, and I think that that advocacy of delay until you find the ultimate answer is just as applicable to the present highway program or bridge program as it is to this.

Dr. NEWMARK. I believe you have a wrong impression and find something in my statement that was not intended when I wrote it, sir. Perhaps it was not clearly stated. I think that we do know enough now to make up a sound program and to begin it. I feel very strongly that you get better results and you save a lot of money if you continue your fundamental studies at the same time that you carry on a construction program.

This is the case in the highway program. We do not drop all of our studies now and build highways on the basis of what we knew last year. We continue very strong basic studies. There is at present going on in the State of Illinois, supported nationally, a test program of a test road at the cost of many millions of dollars which may save a great many more millions in the next 10 years, but we could have dispensed with that, using the same arguments that you have just made about the shelter program. On the other hand, the possible savings from such a program are so great that it was felt we could not dispense with this.

Mr. HOLIFIELD. I am certainly glad to hear you say that. It happens to coincide with my way of thinking that we proceed to build highways and we proceed to try to find out how to build them better.

If there is such a thing as a possibility of nuclear warfare and the need to protect peoples from the effects of that warfare, we do not wait for the perfect answer in structural design before we start doing something about protecting the people as best we can.

Dr. NEWMARK. That is the reason I said in the first paragraph of my statement that we can design structures now and engineers are prepared to do so at any time with the knowledge available at that time.

Mr. HOLIFIELD. You say the problem is not whether we know enough now to design shelters for protection against nuclear blasts, but whether we have sufficient knowledge to design such shelters most economically.

Dr. NEWMARK. That is right.

Some of these cost figures can be reduced with further study and if a program is entered into which spreads the construction over a period of years, this further study can have an effect.

Mr. HOLIFIELD. I would certainly agree with you on that. This is a problem that could not be done all at once, even if we want to do it. It would present a great many difficulties with regard to availability of materials and availability of manpower and certainly it would have to extend over a period of years if we did decide to do it and during

that period of years we would be very unwise if we did not have a very strong program of research and development to improve as we go along.

I certainly would not advocate the freezing of a certain type as being the ultimate answer and the concentration on just one type which we know might not be as successful as we could evolve several years from now.

Dr. NEWMARK. I certainly agree 100 percent with your final statement, sir.

Mr. HOLIFIELD. Are there any questions of the witness?

Well, thank you very much, sir. We will place this testimony in the printed hearings along with the other FCDA testimony and we have been glad to accommodate you so that you could catch your plane.

Mr. GALLAGHER. The next witness, Mr. Chairman, will be Mr. Jack Greene, who is Director of our Physical Sciences Offices and he is going to speak on FCDA research in radiological defense.

STATEMENT OF JACK GREENE, DIRECTOR, PHYSICAL SCIENCES OFFICES, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. GREENE. Chairman Holifield and members of the subcommittee, it is my intention to outline for you the research programs of radiological defense sponsored by FCDA. I shall emphasize the projects relating to shelters. The objective of all such research may be simply stated. We must determine how best to reduce the effects on people of nuclear radiation produced by an enemy attack.

I am referring to two kinds of effects, those caused by direct exposure to radiation and those of an indirect nature, such as contamination of food crops and killing of food animals.

Mr. HOLIFIELD. May I interrupt you at this time?

Two of our members have luncheon engagements with constituents and I am wondering if you folks could come back at 2 o'clock this afternoon.

Mr. GALLAGHER. Yes, sir.

Mr. HOLIFIELD. Then we can start at that time and not have to interrupt you.

Mr. GALLAGHER. Fine.

Mr. HOLIFIELD. We shall adjourn until 2 p. m.

(Whereupon, at 12 noon, the subcommittee recessed, to reconvene at 2 p. m., the same day.)

AFTERNOON SESSION

Mr. HOLIFIELD. The subcommittee will be in order.

Mr. Gallagher, before we start to hear from Mr. Greene, will you supply the committee a list of all of the FCDA contracts now current for research and development and any other related purposes, showing the amount of the contract, the date entered into, the date to be completed and a brief description of the purpose of the contract?

FURTHER STATEMENT OF GERALD GALLAGHER, ASSISTANT ADMINISTRATOR, RESEARCH AND DEVELOPMENT, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. GALLAGHER. I already had a note in response to your request of Mr. Taylor and we will so do.

Mr. HOLIFIELD. I thought I would make that formally to you and if possible we would like to have it before the Governor appears before the subcommittee next Wednesday if you can get that to us.

This is not just with regard to shelters. We are thinking about the other types of surveys and studies that you have contracted for from other agencies.

Mr. GALLAGHER. All right, sir.

(The information referred to is contained in the appendix.)

Mr. HOLIFIELD. Are you still having evacuation surveys made under contract?

Mr. GALLAGHER. The only evacuation work which has been in progress is the survival studies. Those contracts are terminating June 30.

Mr. HOLIFIELD. Are those the phase 1 or phase 2 studies?

Mr. GALLAGHER. These are the final studies that will be made.

Mr. HOLIFIELD. In other words, where they are phase 1 studies you do not intend to follow them up with phase 2 studies?

Mr. GALLAGHER. That is correct. Most of them are phase 2.

Mr. HOLIFIELD. Those will be included in the information you will furnish us?

Mr. GALLAGHER. Yes, sir.

Mr. HOLIFIELD. We just started to hear from Mr. Greene on radiological countermeasures regarding protection.

Mr. Greene, will you start there at the first because you were interrupted just when you got started?

FURTHER STATEMENT OF JACK GREENE, DIRECTOR, PHYSICAL SCIENCES OFFICES, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. GREENE. It is my intention to outline for you the research programs of radiological defense sponsored by FCDA. I shall emphasize the projects relating to shelters.

The objective of all such research may be simply stated. We must determine how best to reduce the effects on people of nuclear radiation produced by an enemy attack. I am referring to two kinds of effects—those caused by direct exposure to radiation, and those of an indirect nature, such as contamination of food crops and killing of food animals.

There are two ways the radiation effects of an attack may be reduced: (1) By reducing the exposure, and (2) by reducing the biological damage produced by such exposure. Of these two approaches, the first has a higher anticipated payoff. This approach, as you know, leads to the provision of fallout shelters which, in the final analysis, constitute the only real protection there is against the probable high levels of gamma radiation that would prevail following a nuclear attack. There is no substitute for sufficient mass in terms of concrete, earth, or other heavy substance to provide shielding from radiation. Clothing made of any fabric or plastic is worthless under these conditions.

Marked improvements in effectiveness of treatment of radiation casualties probably will not occur without considerable future research. Although experimentally increased resistance to radiation damage has been demonstrated in laboratory animals, it is considered unlikely that practical application, insofar as human beings are concerned, will result at least in the near future. Even with the development of practical preventative treatment, only partial protection at best could be expected.

Development of a prophylactic or magic pill to protect against radiation exposures does not seem to be in the cards at the present time. Nevertheless we must continue to study the biological effects of radiation until effective methods are found to reduce the biological damage.

Considerable research sponsored primarily by Atomic Energy Commission, Department of Defense, and FCDA, is now going on in many Government, university, and private laboratories. Such research programs are of course aimed toward specific objectives within the different missions of these agencies. For example, the research conducted by AEC and DOD in connection with designs of nuclear weapons or propulsion of aircraft and marine vessels, or studies of peacetime uses of nuclear power, is not sufficient for the development of practical protection against the expected levels of gamma radiation following an attack.

Notwithstanding that vast effort which has gone into research relating to the very broad subject of nuclear radiation, inadequate proven scientific knowledge exists to assure that our present radiological defense plans are the best that can be developed. At this point I should emphasize that we now have the information with which to start an underground fallout shelter program, because essentially complete protection can be provided by a covering of several feet of earth, which is relatively inexpensive. Our greatest lack of scientific knowledge is in the intermediate area which would relate to such questions as how best to improve existing shelter or incorporate it in new construction. Overdesign might cost millions of dollars—underdesign could cost many human lives.

Deficiencies in this respect are concisely summarized in a pamphlet prepared last year by the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy. I shall say more about the hearings of this subcommittee in a moment. I will now read from the extract captioned "The Need for Operational Information":

The result of a research effort is information. But this information is not necessarily directly applicable to solving a problem. For example, the newly issued handbook the Effects of Nuclear Weapons prepared by the Department of Defense and the Atomic Energy Commission, covers at length the effects of single weapon explosions of varying sizes and under varying conditions. It is apparent, however, that the people of the world and their governments lack information on the operational problems—meaning information that can be acted upon in a given situation—associated with fallout. A generalized way of stating these operational problems is to pose the question: How can man survive in, and how can he respond to, an environment of increasing manmade radioactivity in peacetime and in wartime? Further information of this operational sort appears to be clearly needed covering (1) industrial and weapons sources of radioactive contamination and radiation during peacetime; (2) nonmilitary protection, survival, and recovery measures in wartime and in the postwar period.

This ends the passage I have been quoting.

Effective decontamination will reduce radiation levels and thereby accelerate the rehabilitation of areas affected by fallout. Study of this element of radiological defense is in an early phase. Shelter and biomedical programs, essential as they are to the immediate survival of a significant percentage of our people under conditions of heavy attack, are not enough. Means must be devised to assure continued survival. People cannot live indefinitely in shelters or in their basements on stored food and water. They must come out eventually for longer and longer periods to resume normal activities. Agriculture and industry cannot come to a complete halt.

My discussion to this point was intended to show you how we view the basic and interrelated elements of effective radiological defense—fallout shelters, health measures, and radiological reclamation of urban and agricultural areas. We believe that these elements must be researched and developed concurrently in order to achieve our ultimate objective of effective radiological defense.

I shall now tell you something about our present research procedures and future plans. We have arranged for a cross section of the finest scientists in Government, industry, and the universities to assist in planning and guiding our radiological defense research efforts. There are three steps involved in developing a research program: (1) We must make sure that we have assembled and will make use of existing knowledge that can be applied without undertaking further research; (2) we must know about existing and contemplated programs of applicable research so as to avoid unwarranted duplication; and (3) we must assign portions of research that we propose to undertake to the best qualified research elements within Federal agencies or other public and private research agencies.

Mr. HOLIFIELD. Are you taking full advantage of all the studies being made by the AEC in this field?

Mr. GREENE. We certainly think that we are. We are attempting to.

Mr. HOLIFIELD. I have processed many millions of dollars through my Authorizations Subcommittee of the Joint Committee on Atomic Energy for all types of research into the field of radiological problems and I trust that a close survey is being made of what they are doing and that there is no duplication involved.

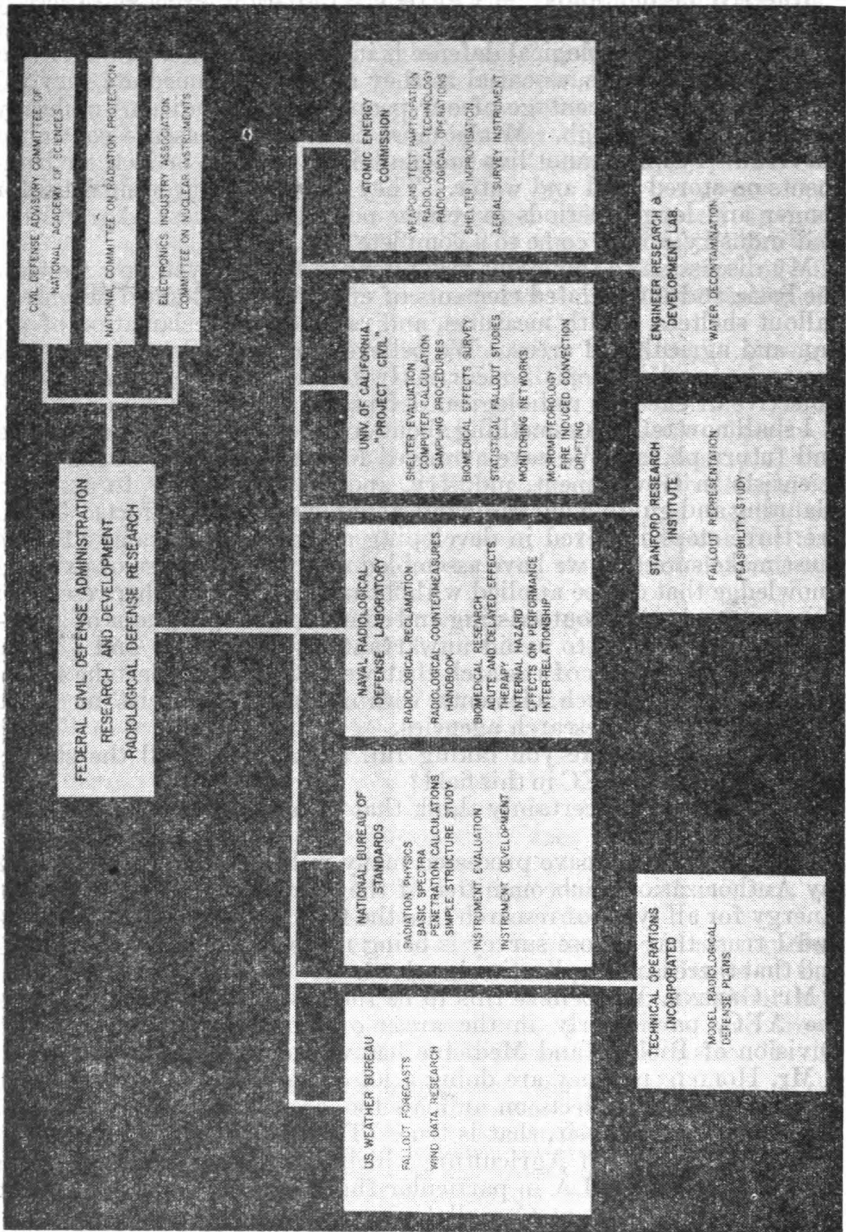
Mr. GREENE. We believe this to be the case, sir. We consult with the AEC, particularly in the areas of biomedical research. The Division of Biology and Medicine has worked with us very closely.

Mr. HOLIFIELD. They are doing a lot of work in the field of plant life and radiation effects on animals too, as well as human reaction.

Mr. GREENE. Yes, sir, that is true. They have sponsored research in the Department of Agriculture which you are familiar with, and the programs of UCLA in particular that we know quite a lot about and the development at Cornell University which stands to give us some very useful information in this area.

Slide No. 61: On this slide I realize you cannot read it too easily from the back so as I go along I will read the language so you will know what it says.

Slide No. 61, agencies and projects: This slide will give you an overall picture of our program related to radiological research. Time does not permit me to go into each project, but I shall cover the highlights.



SLIDE No. 61.—Chart, Federal Civil Defense Administration, Research and Development, Radiological Defense Research.

Names of establishments and the kinds of research they are carrying out are shown in the various boxes. In these boxes [pointing] are the names of advisory committees.

The Advisory Committee on Civil Defense was established under FCDA contract with the National Academy of Sciences. It is chaired by Dr. Lauriston Taylor, Chief of the Atomic and Radiation Physics Division of the National Bureau of Standards. Dr. Taylor will speak to you later. Members of the Committee are outstanding persons in the fields of science and technology. These men are familiar with much of the radiological research completed, in progress, and contemplated in the United States. This Committee is intimately acquainted with our planning and advises us frequently in connection with the conduct of our research programs.

The National Committee on Radiation Protection is also chaired by Dr. Taylor. Its civil defense mission is to provide criteria regarding amounts of radiation exposure to which human beings may be subjected under various emergency situations. In a forthcoming handbook, the Committee will discuss such questions as: When should people be evacuated from contaminated areas, and when should they be permitted to return? What contamination levels should be tolerated in drinking water?

The civil defense mission of the Committee on Nuclear Instruments of the Electronic Industries Association is to provide consultation and technical advice on matters pertaining to the design and mass production of radiological survey meters and dosimeters at a practical cost.

I wish to mention another important source of reference not shown on the slide. I refer to the green books entitled "The Nature of Radioactive Fallout and Its Effects on Man" which were compiled from testimony taken by the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy in the 85th Congress. I am sure that you are familiar with this material since Mr. Holifield was chairman of the subcommittee which assembled the data. These books are important to us because they present many subjects of vital concern to radiological defense, which heretofore had not been assembled and published in this way. For example, a sizable amount of our research is intended to provide a better fundamental understanding of the extent and character of the radiation hazard as it relates to the physical protection required, and to the biomedical problems it creates. In this connection, we must learn more about the distribution of fallout material in a nuclear cloud, how this material is influenced by upper winds, and by weather near the surface. We are provided with an excellent compendium on these and many other subjects in the green books.

I shall now discuss briefly the research programs carried on by the other agencies shown on this slide. The first agency is the United States Weather Bureau in the Department of Commerce. The Weather Bureau has compiled and analyzed wind data taken over a 5-year period. Just being completed is a series of charts based on these data which present the percentage of time the winds that would affect fallout, blow in the various directions and at various speeds. Charts for 41 places throughout the United States will be provided.

The National Bureau of Standards is doing fundamental research relating to the characteristics of nuclear radiation, both the initial radiation produced at the time of detonation and the residual radiation produced by fallout. These characteristics must be fully understood in order to design protective structures. In view of possible expenditures involving large amounts of money for fallout shelters, we cannot apply gross criteria in determining the dimensions of construction materials required to absorb the radiation. Knowledge of the energy spectrum, that is, amounts of radiation of various energies present at different times after burst, is important in this regard because the penetrability of radiation depends on its energy. Dr. Lewis Spencer will discuss a little later with you the research in these areas being carried on at the National Bureau of Standards.

The Naval Radiological Defense Laboratory (NRDL) which has responsibility for many of the basic measurements during the weapons tests series, is carrying on a considerable program of research under agreement with FCDA. Dr. Paul C. Tompkins, Scientific Director of NRDL, will appear before your subcommittee to explain the work they are now doing and the projects that we have planned for future study.

I might mention without invading Dr. Tompkins' explanation that we are looking to NRDL for a major portion of an expanded study of the biological effects of radiation and the methods of treating radiation casualties. Certain biomedical studies of a generally fundamental nature have been in progress at NRDL, supported by FCDA funds, for the last 2 years.

NRDL is conducting studies intended to expand our knowledge of the physical and chemical characteristics of fallout material. These characteristics are important because they affect such things as the solubility of fallout material in water supplies, the path fallout material would take in the soil to plants and thence to animals, and moreover they have a direct influence on the practicability of various methods of decontaminating areas affected by fallout.

Studies to date of decontamination procedures are principally those conducted by the military. It has been shown that special facilities such as bases of military operations can be effectively decontaminated and reclaimed, although the cost may be high in terms of time and effort, and the exposure of operating personnel to radiation. Essentially, no work has been done on the problem of reclaiming other types of areas; for example, residential areas, such as Bethesda and Chevy Chase, or the dairy areas beyond Rockville.

In order to determine the proper course of future action, NRDL is studying the feasibility of large-scale reclamation. There are two immediate objectives: (1) Determination of the logical sequence for reclamation operations with emphasis on "cost" in terms of radiation exposure, finances, support, and logistical factors; and (2) development of "rules of thumb" for these various "cost" factors.

Mr. HOLIFIELD. The Chair would like to say at this time that in our previous hearings we were somewhat critical of the FCDA for not using the resources of the Naval Radiological Defense Laboratory in view of their standing and their organization and their background of study in this field and we are glad to see that you are utilizing those facilities. We believe that in that one laboratory is probably

concentrated more information of value to you in this field than in any other one place.

We are glad to see that you are utilizing them.

Mr. GREENE. Thank you.

Dr. Tompkins later will explain in some detail what is underway at NRDL.

The University of California is conducting research under contract with FCDA on a number of civil defense subjects. We refer to these activities as "Project Civil."

Dr. Ronald W. Shephard, director of Project Civil, will appear before the subcommittee to testify on the work he is directing.

Project Civil has developed a procedure employing the use of high-speed electronic computers for estimating the amount of protection against radiological fallout in various types of buildings in rural or urban communities. Simple standards are being prepared which can be applied by civil defense planners of State and local governments for estimating the amount of reasonably safe shelter now available to them in large buildings, basements, and other structures. They will then be in a position to better estimate their requirements for improving and/or providing additional fallout shelters.

Project Civil is studying the influence of surface winds, eddies, and air currents on the distribution of fall-out. Examples of questions under study are: Will fallout material drift as snow? If so, is there any practical advantage that civil defense can take of such drift characteristics? Could drift fences patterned after snow fences be used for protection?

Project Civil is studying the effects of mass fire on the distribution of fallout. It is known that heated air and other gases rapidly rising in convection columns reach such high velocities that fallout particles cannot settle through. We may need to revise our present thinking regarding the probable wait before rescue, fire fighting, medical care, and other postattack operations can commence in portions of large target areas where a number of fires are raging.

The Atomic Energy Commission provides facilities for testing civil-defense designed shelters and other structures, facilities, and methods under actual nuclear explosions. I shall not dwell on details. This subject has been covered in earlier testimony and you are aware of the vast civil-defense benefits to be gained from these experiments and proof of the pudding.

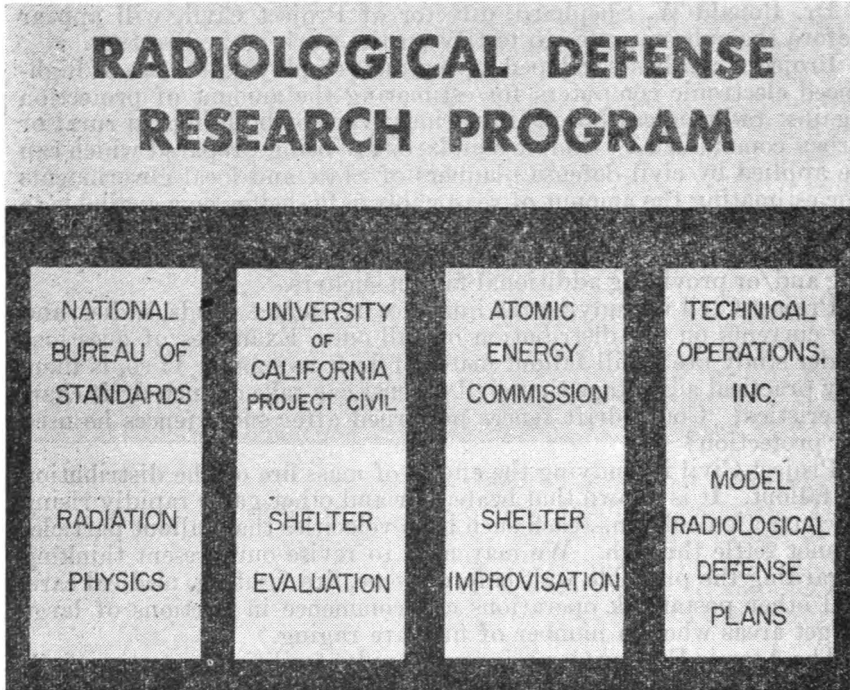
Technical Operations, Inc., conducting pilot radiological defense operational studies in New England using data furnished from the Project Civil and other contractor's studies. Their work involves surveying certain selected urban neighborhoods to ascertain the amounts of available fallout shelter and to prepare prototype radiological defense plans for these communities. This study will culminate in a radiological defense manual providing detailed operational procedures which can be followed or adapted by all States.

Stanford Research Institute is performing important studies in the field of operations research. These studies entail mathematical formulation and electronic computer operations for estimating the effects of the radiological fallout produced by different attack patterns. SRI studies indicate probable consequences of attacks on various resources and segments of the economy facilitating development of

methods of mitigating these consequences. Mr. William White, of SRI, will discuss this research program at greater length.

The Engineering Research and Development Laboratory of the Corps of Engineers participated in Operation Plumbbob in 1957 in connection with testing methods for decontaminating water supply. They are continuing research in this important field.

Slide No. 62: The final slide is intended to show how the individual pieces of a research study may be put together.



SLIDE No. 62.—Chart, Radiological Defense Research Program.

In research relating to radiation protection provided by shelters, the National Bureau of Standards performs the fundamental research, developing and proof testing basic theory. This theory is applied by project civil in working out practical civil defense problems. At the same time the work at the Nevada test site relating to emergency improvisation of radiation shelters, discussed for you earlier by the AEC, contributes to the programs of the Bureau of Standards and to project civil programs; and these programs in turn influence the field tests.

Finally, the progressive results of this research are applied to operational planning by Federal, State, and local civil defense staffs, as well as in such contracts as the radiological defense pilot study being performed by Technical Operations, Inc.

This concludes my formal comments. I have attempted simply to give you an overall view of a pattern of research in which the interrelated fields will be detailed further by the gentlemen who now will be responsible for presenting them.

Thank you.

Mr. HOLIFIELD. Thank you, Mr. Greene.

Are there any questions from the members or the staff?

Mr. ROBACK. Mr. Greene, you did not mention the radiological monitoring that the AEC did, did you?

Mr. GREENE. No, I did not.

Mr. ROBACK. How does that fit in?

Mr. GREENE. I am not sure which particular monitoring you are referring to.

Mr. ROBACK. Air monitoring.

Mr. GREENE. This has to do with an aerial survey instrument developed by the New York Operations Office of the Atomic Energy Commission initially for use in the Pacific and later we have financed its being adapted to civil defense use. It was tested during the last test series. The instrument now is in the production-engineering stage. That is, it is being prepared for commercial production.

Mr. ROBACK. Do you have an air monitoring program? Are you developing the requirement for air monitoring for radiation?

Mr. GREENE. Yes, we are. This instrument is one of the basic components of such a system and we have been working on this for the last 2 to 3 years. We have also sponsored during the last test series—and I do not think this was mentioned earlier—participation by the Civil Air Patrol in working out techniques for aerial survey using existing instruments which can be adapted when these special instruments become available.

Mr. HOLIFIELD. This is not duplicative of the work done by the Weather Bureau in the sampling of air, surface, and water, is it?

Mr. GREENE. No, sir. I believe Mr. Roback referred to aerial survey. That is actually evaluating radiation levels by means of aircraft flying over contaminated areas.

This is particularly useful because of the vast areas that will have to be covered and by the fact that one flying in an airplane can stay above the high levels of radiation and thus make measurements without overexposing personnel.

Therefore, we think aerial monitoring has a very important role in civil defense.

Mr. ROBACK. What I was wondering about is whether there is any way in which these various radiological studies are brought together. Your presentation shows there is some relationship between those, but do you have anything to say about the AEC program for such work?

Mr. GREENE. Actually we financed the development of this particular instrument, the modification from the specialized AEC use, to civil defense use. This is the only financial support that we have provided.

Mr. ROBACK. Now, the military agencies have specialized requirements for their own missions, but in trying to determine radiological hazards, they also sponsored studies.

Now, what studies are being sponsored by the Department of Defense in the radiological field? Do you have knowledge of that?

Mr. GREENE. Yes, we do. In the instrumentation field, for example, we have served as a member, or associate member of the advisory panel on radiological instrument development. There is a panel that is advisory to the Armed Forces special weapons project and through.

meetings of this panel the research programs relating to the instrumentation are thoroughly discussed periodically and we thereby have access to, I would say, essentially complete information in this field.

We have various means of obtaining information through the Armed Forces special weapons project, through the weapons test series, of course, and through direct personal visits with many of the people in the military and the AEC who are working in this field, most of whom by now we know quite well.

Mr. ROBACK. Are you satisfied in your own mind that the military studies on radiation are not duplicative of the ones that you are sponsoring?

Mr. GREENE. Yes, I would say that we are.

As an example here we have a project at the Bureau of Standards which Dr. Spencer will discuss in which there is joint participation by FCDA and the special weapons project.

Mr. ROBACK. There is just so much information in this field and if you plow the same ground over and over again you may reach the point of diminishing returns.

Mr. GREENE. That is certainly true. Unfortunately in many cases AEC and DOD do not have the same objectives we have. Dr. Spencer's testimony, I think, will exemplify one case quite well.

Mr. ROBACK. There was a report in the paper this morning that the Navy was considering construction, in connection with the Bethesda Naval Hospital Center, of a radiological evaluation clinic or hospital or center, presumably to study radiation exposure and effects.

The Navy rationale for determining that that could be a Navy project, rather than AEC, or FCDA project, as stated in the newspaper, is that they are going into the era of nuclear powered ships and submarines and so they ought to have a laboratory to study radiation effects on people.

Mr. GREENE. I would really rather not try to answer that because I am afraid I could not represent the Navy properly.

I recognize that the Navy has special problems for the people in submarines and nuclear-powered vessels. They are subjected to continuing exposure at low rates. They have had a rather substantial research effort going on at the Naval Medical Research Institute for several years.

Mr. ROBACK. You have not mentioned in your discussion the work to be done by the American Medical Association. Does that fit into this program?

Mr. GREENE. This is not directly related. I have spotlighted the radiological defense studies. I have not tried to cover the whole waterfront.

Mr. ROBACK. What is the nature of that study?

Mr. GREENE. May I defer to Mr. Gallagher?

Mr. GALLAGHER. It is a contract with the American Medical Association which we will describe in material we are going to give you. It is essentially one of having the profession look at their resources, how they are dispersed or located throughout the country in respect to specific operational problems. The study at this moment is centering around Minneapolis-St. Paul, and the States adjacent thereto. They are looking essentially at the business of developing operational plans for the utilization of physicians and medical personnel. This is

not so much equipping them with advanced knowledge as being able to use the personnel who exist.

Mr. HOLIFIELD. Thank you, Mr. Greene. We will proceed to the next witness.

Mr. GALLAGHER. I am going to vary our program a little bit, Mr. Chairman, and ask that Dr. Tompkins appear. He has an appointment this afternoon. He needs no introduction, I am sure.

FURTHER STATEMENT OF DR. PAUL C. TOMPKINS, SCIENTIFIC DIRECTOR, UNITED STATES NAVAL RADIOLOGICAL DEFENSE LABORATORY, AND DIRECTOR, CETG PROJECT 32

Dr. TOMPKINS. Mr. Holifield and members of the subcommittee. Mr. Greene has already indicated to you the projects which the Federal Civil Defense Administration is currently sponsoring at the United States Naval Radiological Defense Laboratory in the field of radiological defense.

It is my function to describe for you what we are doing under these projects and why. I will also discuss briefly additional projects which are currently being considered between the laboratory and the FCDA.

Before discussing the specific projects, I would like to spend a few moments discussing the technical and scientific relationship between the work being conducted at USNRDL and the work being conducted by the Atomic Energy Commission, elsewhere in the Department of Defense and also by other contractors to the FCDA.

To understand the relationship of the laboratory to civil defense, it is necessary to know the major areas of knowledge pertinent to the responsibility of the FCDA and the Government agencies primarily involved. These are summarized as follows:

- (a) Weapon effects and fallout prediction: AEC, DOD, Weather Bureau, FCDA (CETG).
- (b) Shelters: FCDA, DOD, AEC.
- (c) Decontamination: FCDA, DOD.
- (d) Environmental radioactivity: AEC, United States Public Health Service, DOD.
- (e) Operation analysis studies: DOD, FCDA, Office of Defense Mobilization.
- (f) Biological effects: AEC, DOD, USPHS, FCDA.
- (g) Shielding by existing structures: FCDA, National Bureau of Standards, DOD, AEC.

NRDL has participated technically in each area wherein the DOD is mentioned. Technical data by itself is not useful unless it is integrated and coordinated into a framework which will permit good decisions to be made in specific situations.

The FCDA program at the NRDL is, therefore, oriented primarily to the objective of bringing research information already in effect to a point of specific applicability to the problem of nonmilitary protection and recovery in wartime, and in the postwar period.

If I may pause momentarily and comment on questions recently asked by Mr. Roback, it is the intention of NRDL to bring to bear, within the background we have in the field, to the selection and proper utilization of that information which already exists to the specific application of the civil-defense problem.

Now, our resources may not be adequate to the total job but that is the area in which we are specifically concentrating.

To continue, the particular projects are:

1. Radiological defense research—biomedical aspects. The practical goals of the proposed experiment will be to provide:

(a) Knowledge of possible biological indicators through which it will be possible to evaluate the extent of radiation damage and to predict the delayed effects quantitatively.

(b) Information of practical value to civil defense in sorting casualties who may have been subjected to radiation.

(c) A basis for determining the radiation exposure threshold which can be tolerated by masses of people who may be returned to an area in which radiation levels, presently considered insignificant, may exist over a long period of time.

I think you will appreciate that in order to make the selective judgment from the mass of research on basic biological effects which has been accumulated through the AEC program, that specific attention must be paid to the potential exposure conditions to which the civilian population may be subjected and also to the implications of different desired levels of protection.

These things are interrelated and cannot be separated. That, then, is the objective of the biological program of the laboratory.

The second project covers radiological reclamation. This project relates to large scale decontamination. One phase is devoted to rules of thumb for various cost factors and is drawing on research work sponsored over the past several years by the Army, Navy—particularly the Bureau of Yards and Docks—and Armed Forces special weapons project.

A second phase is devoted to somewhat more fundamental aspects such as the study of factors affecting the contaminability of surfaces. This kind of information is necessary to relate the measurable properties of construction materials to contaminability by material of the composition of fallout. In this connection, it is significant to observe that radiation measurements such as r./hr. do not scale from one detonation condition to another, whereas the material matter in fallout does.

Parenthetically, I might note also that all the basic weapons effects are in r. per hour. It is the conversion which will make that information, we believe, directly usable to the civil-defense purpose.

Therefore, under these circumstances, decontamination efficiencies can be measured by using a weight of material as observed at different radiation intensity levels.

Additionally, we think it is now possible to re-create synthetically the material deposits which will be observed at any radiation intensity level so far observed from any of our megaton weapons. Therefore, we are no longer completely dependent for progress upon testing for advancement.

Therefore, testing in this area is coming to the position of verification rather than primary advancement.

Mr. HOLIFIELD. If this is true—and I know you want to have your qualifications considered in this statement, this will mean that we can enter a laboratory type of controlled testing which will give us the results that we want out of testing without the subsequent atmospheric

hazard, or contamination which exists now, with the actual weapons.

Dr. TOMPKINS. That is correct, Mr. Holifield, and our laboratory is advocating heavy emphasis on this approach.

Mr. HOLIFIELD. At this time for the record—because many people will read this record—will you give us about 5 or 6 of the most important elements of contamination in a bomb explosion and let us consider, if you wish, separately, an atomic bomb and an atomic-fissioned fusion bomb and give us the various types of contamination. I do not want you to go into 40 or 50 types that we know exist, but the ones we are mainly considering in this area of protection from contamination.

Can you do that?

Dr. TOMPKINS. I think so, if I can properly interpret the exact nature of your question.

The elements of radioactive contamination and fallout which are of primary concern, I believe.

Mr. HOLIFIELD. And the characteristics of each, considering your gamma, beta, neutrons, and so forth.

Dr. TOMPKINS. As Dr. Harris mentioned yesterday, any detonation, either thermonuclear or fission, creates radioactivity. The fission process gives rise to the well-known fission product group of elements, all of which are intensely radioactive, and I think technically one might say that the mixture of the fission products in terms of hazard to people under all conditions and at all times is perhaps as mean a mixture as it is possible to create.

Specifically those of us who have been involved in this subject have considered many times the potentiality of synthesizing from isotopes a mixture that would have hazardous characteristics, dangerous at early times from gamma ray, and dangerous at intermediate times from gamma, and dangerous at later times for gamma rays. Short-lived, high-intensity materials but nevertheless longer-lived, lingering materials, a mixture of which would be equally dangerous taken internally by breathing, by drinking, or by eating, whether this was done early or late.

To my knowledge, no one has successfully competed with the fission product mixture in this capacity.

Mr. HOLIFIELD. That is, they have not been able to synthesize so deadly a mixture?

Dr. TOMPKINS. That is quite correct. I think this is characteristic. Also, I think perhaps the implication of the insidiousness of this mixture has been overlooked in the so-called clean weapon versus dirty weapon controversy.

From my point of view, the fission mixture is the meanest thing to cope with that it is possible to get. However, at the same time, any weapon detonation also gives off excess neutrons. Excess neutrons create radioactivity induced in the environment in which it is detonated.

If it is under the surface of the sea, we create radioactive sodium, potassium, and other elements. If it is on the ground, we induce activity in the ground.

The interaction of the neutrons with the nitrogen of the atmosphere creates radioactive carbon 14. The significance of the secondary processes depends entirely on their mounts. I think this also has perhaps been a source of some misunderstanding.

Mr. HOLIFIELD. Before you leave the fission products, could you describe the beta rays and the hazards, and the half life, then the gamma rays and their span of hazard and their half-life duration? You may want to bring in the strontium 90 in the thermonuclear field rather than in the fission field, but treat all of those and give the record some sort of an evaluation of the degree that we have to consider in building these shelters.

Dr. TOMPKINS. I will give myself 3 minutes and take a try and see if I can come close to succeeding.

We are interested in radioactive materials because of the nuclear radiation which is given off by them. There are more than 3 types actually given off but there are three major types of direct concern. First, the beta radiation which, for all practical purposes, has significance in two counts: It can cause a burn on the skin if the radio element is deposited on the skin. If the radioactive elements are taken inside of the body, they can cause somewhat higher intensity direct exposure to the sites very close to where they are deposited.

This is the origin of the problem with strontium 90 which deposits in the bone marrow and produces short-range beta radiation.

The second major cause of concern is the gamma exposure type, or gamma radiation type. For all practical purposes, gamma rays are, for purposes of this discussion at least, the same as that which you would get from an X-ray machine. They travel large distances in air, they are capable of penetrating through and into dense matter. They are deleterious to the human body. It is the gamma radiation which is of primary concern to all emergency operations of civil defense. This threat of gamma radiation is the one which must be defeated because all other threats are secondary to it.

Mr. HOLIFIELD. Give us the half life of the beta and gamma, if you can.

Dr. TOMPKINS. I was hoping to duck that question, Mr. Chairman.

Mr. HOLIFIELD. I know you scientists want to be absolutely accurate but give us an approximation. A relative approximation, I mean. The beta is short-lived, we know that.

Dr. TOMPKINS. The half life by definition is the time it takes for any particular radio isotope to decrease in intensity to one-half of its so-called initial value. Every isotope has its own characteristic half life. This is independent of the nature of the radiation that it emits. With the fission product mixture the so-called half life is usually characterized by the T-1.2 rule.

I think the testimony at your Joint Committee summed this up by saying that every time you double the time you decrease the radiation intensity by approximately a factor of 7—do I have this right now?

Mr. SHEPHARD. Seven to a half.

Dr. THOMPSON. Another way to put it, the half life of radioactive decay is roughly equal to the age. After 5 minutes the radiation intensity will decrease in the next 5 minutes to one-half of that value. This, then, gives you a starting time of 10 minutes after detonation. In the next 10 minutes, it will go down by another half.

The age is now 20 minutes and the next 20 minutes it will go down by another half, and so it goes.

The significant point is that the rate of decay at early times after detonation is exceedingly fast. It is during this period that the intense radiation intensities are encountered.

So the greatest threat from fallout is always during the relatively early periods. This is why the massive doses are obtained in a matter of a few hours, to a few days.

Mr. HOLIFIELD. And this is why the shelter can render such a great service. The radiation shelter can render a great service even if it only amounts to a few hours or a couple or 3 days.

Dr. TOMPKINS. Yes, sir.

Mr. HOLIFIELD. It can give this fast decay a chance to perform its function of reducing the intensity of radiation before the human body comes outside to be exposed to it.

Dr. TOMPKINS. Yes, that is correct. But that is also why shielding is an absolute essential. There is no alternative to this as a basis of protection.

Mr. FASCELL. At the present time.

Dr. TOMPKINS. I will stick my neck out, sir, and say for some time to come.

The reason for a shelter is for the same reason you put a shield around a reactor. In case you do not know it, you do not get intensities from reactors that are very much in excess from what you would get at peak intensities from fallout.

Mr. HOLIFIELD. Your beta contamination goes down very fast.

Dr. TOMPKINS. Yes, sir.

Mr. HOLIFIELD. It is over in just a few hours?

Dr. TOMPKINS. And so is the gamma.

Mr. HOLIFIELD. Your gamma is over in a short length of time. What is the general half life on that?

Dr. TOMPKINS. I would like to be sure to try to keep this straight, Mr. Holifield.

Both the beta and the gamma radiations decay approximately equally. Technically, in terms of pure science, this is not quite right but the rate of decay affects both types of radiation.

Mr. HOLIFIELD. But the penetrating quality is different, is it not?

Dr. TOMPKINS. This is the point. At all times, the fallout mixture is emitting both beta radiation and gamma which means that if you are in the open and get the full brunt of the gamma radiation, you are getting penetration to the whole body. Also, if you get light shielding you are getting penetration through the whole body through the shield.

If you are exposed momentarily and get some of the fallout material on your hand, and then get under a shield and carry it with you, the beta radiation coming from the particles themselves are quite capable of causing a burn.

This was the cause of the burns which you saw on the natives because they were taken from the field prior to the time that the gamma radiation had had its major effect. They carried the fallout particles with them and there the short-range intensities or the beta particles superseded that of the gammas but you know that applied only to local skin burns and these things are present all the time.

It depends entirely on how you happen to brush up against them, what the relative significance becomes. That is why in radiological

protection so much is made of protective clothing. All this does is keep the particles off your body and thereby defeats the short-range beta hazard and reduces it to very manageable proportions.

The gamma problem is not so easy to cope with. I would like to continue just a moment, if I may, in summarization.

The important characteristics of the fallout material are every bit as dependent upon the detonation medium as upon the nature of the weapon. Detonations in water create fallout material which are inherently soluble. Detonations on the ground, no matter what kind of ground, creates fallout materials much of which is relatively insoluble. This means it is not chemically available. These facts are minor in significance to the gamma radiation threat during early periods. They are tremendously significant to the process of subsequent removal, because water will stick to surfaces where big particles of dirt will not, but even more significantly, it is tremendously important in the later agricultural problem which is determined by the incorporation of these radioactive elements in the biological cycle and are taken up into food and ultimately wind up in the body.

Mr. HOLIFIELD. You are speaking now of the long-life deposits, strontium 90 and—

Dr. TOMPKINS. Yes, and I am also speaking of the problems encountered in obtaining drinking water at relatively short times—say the first month. Remember, the fission product mixtures contain barium and lanthanum isotopes which are as dangerous as strontium except for their half lives. They are present from the beginning to the end.

And the rate at which this material can become available to such things as drinking water sometimes becomes very, very significant in the ease with which you can handle them.

In summary, it is simply this: The fallout from water detonation is far more available biologically than fallout from land area. By a factor of about 2 to 5 in many cases. Fallout close in which creates the mammoth fallout threat which we have all heard discussed, is mostly large particles and is inherently insoluble.

Specifically, I am of the opinion that any land detonated fallout material which is inherently lethal will be associated with enough material to be visible and if any American citizen is worried that he will be killed by radiation from fallout and not know it is coming, I think they need not be worried simply because, from our mass activity relationships, we do not get that intense a fallout deposit in the absence of visible quantities of material.

Mr. HOLIFIELD. In other words, if the Japanese fishermen had realized what was falling on their ship and had washed it off and taken baths and washed their hair, there would have been a great deal of difference in the deleterious effects?

Dr. TOMPKINS. That is exactly correct and you need nothing but your eyes to tell you this. It was the fact that they did not recognize it was radioactive that got them into trouble.

I point these things out because it is this kind of information that we are pulling together specifically for the civil defense.

Mr. HOLIFIELD. It would not apply to damage by neutrons?

Dr. TOMPKINS. No, sir.

In summary, I would say that fission materials are more dangerous than the induced radioactivities from neutrons created by fusion.

However, radioactivity is always present and quite often in quite significant quantities. The magnitude of the radioactivity problem can be changed markedly by the weapon design but it cannot be eliminated.

There is one characteristic of the fallout threat which I think should be incorporated in such a summary: The dangers are, exposure of the whole body to radiation from penetrating gamma, burn on the surface of the skin from material deposited on the skin coming from the beta radiation and, finally, the more delayed hazards of ingestion and so forth.

I do not want to go too deeply into this because Dr. Taylor will cover it far better than I, but in summary those are the three general classes of hazard.

The killer is the gamma, associated with close-in fallout. That is the major threat.

Mr. HOLIFIELD. Now, when you say close-in fallout, you put the meaning on that of the larger particles of debris which fall downwind from an explosion, usually, to distinguish that from the type of radiation that would go through the troposphere into the stratosphere.

Dr. TOMPKINS. Yes, sir.

Mr. HOLIFIELD. And it is this type of radiation primarily that we are concerned with in our protective shelters.

Dr. TOMPKINS. That is correct.

Mr. HOLIFIELD. I might go so far as to say that for all practical purposes it is the only one with which you are concerned, for protective shelters.

Dr. TOMPKINS. We can't do much about the other.

Mr. HOLIFIELD. They are relatively insignificant. If you properly defeat the gamma radiation from fallout, the others automatically take care of themselves.

The reverse is not true.

Mrs. GRIFFITHS. What does close-in mean in relation to a 20-megaton bomb?

Dr. TOMPKINS. This is strictly a line of demarcation between, I might say, worldwide fallout and so-called close-in. In the case of a 20-megaton weapon, it would extend to a distance of 350 miles.

Mrs. GRIFFITHS. That is not very close.

Mr. HOLIFIELD. It is an important question you ask because if a 10-megaton weapon would contaminate 9,000 square miles, roughly speaking, downwind, a 20-megaton weapon would cover a greater area and this is why, when you disperse 150 weapons over the United States, you have a universal contamination, practically. There might be some areas that would escape some contamination and there would be many areas that would have light contamination, but there would also be a great many areas that would have much more than lethal and even overlapping. Instead of the lethal damage of four or five hundred roentgens, it might run as high as five or six thousand.

Dr. TOMPKINS. That is correct.

Mr. HOLIFIELD. There are two features about the fallout patterns with which we are acquainted which have not been properly emphasized. The first feature is that the peak intensity never occurs at the crater. It occurs about 50 or 75 miles downwind from the crater.

It gets picked up, caught low on the wind and gets carried downwind. So the major intensity of the fallout threat that you are going to cope with is outside of the area of physical damage, and this is significant to all considerations of shelter, particularly where one considers relaxing the shelter requirement because of presumed distance from a potential target area.

And this is also, sir, why you start saving life close to the lip of the crater. By that I mean undoubtedly if it is a ground burst everything will be lost within the area of the crater, but very shortly outside of that crater, if you are underground, you do have an opportunity of saving life both from shock and heat as well as from radiation. One of the factors in that is that your peak intensity of radiation does not necessarily come near the lip of the crater but it may be carried to the first deposits of the heavier particles downwind.

In layman's language that is roughly correct?

Dr. TOMPKINS. Yes, it certainly is. This is one point I did want to make, Mr. Holifield, because it is one which is certainly built into all the technical information we have but it has simply not been hauled out and stated quite as explicitly as I have stated it here. In other words, I am willing to stick my neck out and say the major residual radiation threat does not occur within the range of physical damage.

Mr. HOLIFIELD. From radioactivity.

Dr. TOMPKINS. Yes, sir.

Mr. HOLIFIELD. The life would be lost within the area of physical damage from heat and blast?

Dr. TOMPKINS. Well, this is significant, though, when it comes to shelter design criteria, this is the point I am making.

The second point I might make is that the long-range agricultural biological threat is quite different in its behavior from the penetrating gamma radiation threat.

Specifically after the deposit is all over, the contours defined by the external gamma radiation, with the customary roentgens per hour shrinks continuously with time.

Mr. HOLIFIELD. I think this is important enough to take an actual figure, if you can. Let us assume a very high intensity figure of 5,000 roentgens per hour for the first hour. Could you, without too much mathematical computation, tell me what the decline in that would be within a period of 10 hours?

Dr. TOMPKINS. From 5,000 per hour?

Mr. HOLIFIELD. Yes.

Dr. TOMPKINS. 10 hours, I think, is roughly a factor of 15.8, I believe. I would prefer to look it up for you, Mr. Holifield, you can pick it right off of the decay curves but I think it is better than a factor of 10 reduction.

Mr. HOLIFIELD. Wait a minute. Give us that in layman's language. It goes down from 5,000 to what?

Dr. TOMPKINS. In 10 hours I think it will go down to something on the order of 315.

Mr. HOLIFIELD. You substitute the correct numbers because the point I want the record to show here is that the first few hours you need protection from lethal radiation and that it does decay in a very few hours to the point of tolerance of the human body. This is the point I am trying to get for the record. So you use any figure which comes to your mind.

Dr. TOMPKINS. You started off with 5,000, Mr. Holifield.

Mr. HOLIFIELD. That is what I asked you for. I just picked a number out of the air.

Dr. TOMPKINS. At 10 hours I would say roughly 10, in intensity. That would be 5,000 to 500. I would prefer, if I may, to send you a calculation which gives it, for the reason that the dose delivered is not proportionate to the dose rate.

Mr. HOLIFIELD. If you will furnish us those figures and not only carry 10 hours, but let us carry it 3 days—any family can stay in a shelter 3 days without too much discomfort if their lives depend on it.

Dr. TOMPKINS. I can give you an illustration in using the figures we have, Mr. Holifield.

With 5,000 roentgens per hour, the total dose to infinity would be roughly 23,000 roentgens, from the time we started at 5,000 roentgens per hour measurements. In other words, it is about 4.8 times that for a large yield weapon. Of this amount, about 60 percent is delivered within the first 3 days.

Mr. HOLIFIELD. In other words, it goes down to 10 percent within 3 days, is that right?

Dr. TOMPKINS. Not only does the dose rate go down but the accumulated dose does not go completely because it is also going down so fast but of the 23,000 or 4,000 roentgens total exposure the people in this area would get then if they stayed in the open, about 60 percent of it, you get in the first 3 days and this is superlethal many times over. This is the point. It is this critical period for which one must set up the defense.

(The following information was subsequently furnished:)

SUPPLEMENTARY STATEMENT OF DR. PAUL C. TOMPKINS, SCIENTIFIC DIRECTOR,
UNITED STATES NAVAL RADIOLOGICAL DEFENSE LABORATORY

The following table shows the total gamma exposure that one would anticipate would be received by a person in the open during different time intervals after the time of detonation. The information is presented as follows:

First column: Time intervals of interest to radiological defense.

Second column: Total dose accumulated in the open during the time interval assuming a basic reference exposure rate of 5,000 R/hour at 1 hour after detonation.

Third column: The accumulative dose from 1 hour to the end of the time interval.

Fourth column: Exposure rate at the beginning of the interval.

Fifth column: Exposure rate at the end of the interval.

This table shows that a 100-percent lethal exposure will be possible in periods of approximately 10 minutes 1 hour after detonation, in 2 hours, at 10 hours after detonation and in about 10 hours 3 days after detonation.

It also shows that the massive threat from whole body gamma radiation is greatest during the early periods after detonation so that complete protection during this period is a necessity. The exact time depends on the initial exposure rate.

This table is not developed by the application of the $t^{-1.2}$ rule, but is derived from experimentally observed decay curves of megaton yield weapons.

Time interval	Exposure in time interval R	From 1 hour accumulated exposure R	Exposure rate	
			Start R/hour	Finish R/hour
1 to 10 hours.....	8, 800	8, 800	5, 000	310
10 hours to 3 days.....	1, 920	10, 720	310	55
3 days to 1 week.....	9, 300	20, 020	55	19
1 week to 2 weeks.....	1, 375	21, 400	19	5. 6
2 weeks to 1 month.....	1, 175	22, 570	5. 6	2
1 month to 3 months.....	1, 215	23, 790	2	. 43
3 months to 6 months.....	560	24, 350	. 43	. 16
6 months to 1 year.....	295	24, 645	. 16	. 03
1 year.....	130	24, 775	-----	-----

Criterion: Generation of acute radiation injury (death in 30 to 60 days) starts at exposure levels above 150 roentgens received in 1 day. More delayed casualties develop at a total accumulated dose in excess of 150 roentgens.

The meaning of dose:

LD_{100}^{30} = 600 roentgens for 100-percent mortality in 30 days means that every one so exposed will be expected to die in 1 month or less. Survival potential for an individual = 0.0.

LD_{50}^{30} = 450 roentgens for 50-percent mortality in 30 days means that half the people so exposed will be expected to die in 1 month or less. Survival potential for an individual for at least 1 month is 50-50. However, latent injury is certain. Some will live less than a year, some for more than a year. Accumulated dose = 100 roentgens—no acute mortality. Latent injury only.

Standard should attempt to keep exposure to less than 100 roentgens per year. Anything more than this will lead to casualties, the only argument being related to quantitative numbers for how many casualties will occur and the time span involved.

Mr. HOLIFIELD. I think this will mean a great deal to the lay reader as to the importance of the shelter, even if it only be for a few days because that gives you a chance for the natural decay to take place in the radioactive elements, and then, assuming people could stay in shelter for a period of a week or 3 days to a week, they could come out and still survive, theoretically. Of course, there would be other problems, such as the contamination of vegetable matter and water and other things to be taken care of, but those also could be taken care of by other means.

Mrs. GRIFFITHS. Will it kill plant life within this area.

Dr. TOMPKINS. It depends on who you ask. Certainly, something is going to happen.

Mrs. GRIFFITHS. It will either kill it or change it.

Dr. TOMPKINS. The fact that a few things happen, subjectively, yes, there will certainly be some changes. Whether they are significant enough to really cause us great concern, I think it is currently a debatable point.

Mr. HOLIFIELD. Dr. Tompkins, I think we are going to have to have you some time when we can give you about 3 or 4 hours of questions. We are going to have to move along because I promised some of these folks a chance to catch planes and I am afraid we are going to have to stop what is to me and I know for other members of the committee a very interesting exchange of questions and answers.

Had you finished your paper?

Dr. TOMPKINS. I had only one more project to cover, Mr. Holifield, but it is in the statement and it is very short.

Mr. HOLIFIELD. Go ahead and read it.

Dr. TOMPKINS. On the matter of countermeasures, it relates to the production of a manual similar to the Radiological Recovery of Fixed Military Bases but adapting it to civil defense use. This is the basic planning guide which is currently in use by both the Army and the Navy which is produced at NRDL and is the project which Mr. Greene previously mentioned. We will attempt to convert this to the operational conditions affecting civilians. The difference being not on the technical data but in the operational application. We will have to select different combinations to suit the civilian conditions because you have different command principles you have to adapt to.

I think that summarizes the work which FCDA is sponsoring with us. If there are any other questions, I will be happy to try to answer them.

Mr. HOLIFIELD. Thank you very much, Dr. Tompkins.

Dr. TOMPKINS. I am sorry if I have monopolized the time of the other witnesses.

Mr. HOLIFIELD. They will have to blame the committee for that because they were the ones who kept you, Dr. Tompkins. Dr. Tompkins was a consultant to the Joint Committee on Atomic Energy in the special radiation study that was mentioned and did a very good job in helping to draw up the agenda and the list of witnesses who appeared before that committee.

Who is your next witness?

Mr. GALLAGHER. Next we have Dr. Lauriston S. Taylor who is Chief of the Atomic and Radiation Physics Division of the National Bureau of Standards.

As Mr. Greene told you, he is Chairman of the National Committee on Radiation Protection and in addition, he is Chairman of the Civil Defense Advisory Committee of the National Academy of Sciences.

Dr. Taylor.

STATEMENT OF LAURISTON TAYLOR, CHIEF, ATOMIC AND PHYSICS RADIATION DIVISION, NATIONAL BUREAU OF STANDARDS

Mr. TAYLOR. I want to talk mainly and in rather general terms about the program of the National Bureau of Standards.

The staff of the National Bureau of Standards contributes to civil defense efforts in three ways: (1) By providing expert advice and consulting service individually or through membership on committees; (2) by active work on projects supported by the Federal Civil Defense Administration at NBS; and (3) by work on closely related projects which are supported by direct appropriations from Congress, or by the Armed Forces special weapons project, the Office of Naval Research and the Atomic Energy Commission. Many of these are so closely related we scarcely know where one area of interest begins and the other ends.

For the sake of brevity, I will confine my statements to my personal participation in item (1) and a general picture of the work on item (2).

COMMITTEE ACTIVITIES

1. The National Academy of Sciences has an Advisory Committee on Civil Defense, and I am serving as chairman of this committee. All phases of the research and development program of FCDA are being studied by the committee, although for the past several months we have devoted a major part of our attention to the problems involved in a shelter program. At present, we are actively engaged in an intensive review of this whole subject.

2. Several years ago, the National Committee on Radiation Protection set up a Subcommittee on Permissible Exposure Doses Under Emergency Conditions.

Incidentally, I would like to insert parenthetically at this point that several times it has been mentioned that the National Academy of Sciences has set permissible exposure levels for workers in this country.

The National Committee on Radiation Protection has this responsibility and the National Academy has provided some of the background information necessary for this.

This special subcommittee was formed at the request of the FODA and is now in the process of developing a set of radiation exposure standards that could be applied under conditions of nuclear disaster. The study is carried out by a group of some 20 of the Nation's leading authorities in the field. The prime consideration has been one of immediate survival, with second emphasis on long-range complications.

By long range, I am referring to genetic effects and effects on life span.

Preliminary guides have been supplied to FCDA, but as chairman of this subcommittee I may say that we are having considerable difficulty in reaching agreement as to the final form in which the material may be presented; there is no basic disagreement as to the substance. Here we are thinking about doses as large as 100 roentgens in a day or less than a day as compared with average peacetime occupational exposures of two one-hundredths roentgens per day.

We are stepping up the magnitudes here by orders of five to ten thousand times. When you realize that we are dealing with narrow margins between life and death, you can see the complexity of the problem.

PROJECTS AT NBS SUPPORTED BY FCDA

(1) The Radiological Equipment Section evaluates the characteristics of various instruments for the measurement of radiation, such as dosimeters and survey meters. They perform many tests of new instruments submitted by manufacturers to assure compliance with FCDA specifications, and they calibrate instruments and radioactive sources for use by FCDA.

2. A project on radiological physics for civil defense was established to provide FCDA with a central point for both active research and the coordination of the efforts of other laboratories in the problems of radiation physics relevant to civil defense.

A substantial and diversified scientific pool of knowledge, which is not otherwise promptly available to FCDA on an organized and continuing basis, is thus maintained.

Specialists in radiation physics act as a group for analyses, evaluations, and compilations of data, and carry out (or persuade qualified physicists in other laboratories to perform) specific research investigations and theoretical computations.

One important phase of this project was a survey of available data on the energies (that is the spectra) and the intensities of radiations from nuclear weapons. These are the "input" data—the facts necessary for realistic appraisal and scientific evaluation of the major factors contributing to the radiation dose.

They are essential data in any scientifically valid method of computing the penetration of radiation. The preliminary survey disclosed that a substantial portion of this basic information did not exist—no one had taken time out from the immediate, specific, and hence limited engineering tests to determine these fundamental facts which are the solid foundation for building new and more useful applications.

At this point, I would like to introduce for the record an informal report, prepared for FCDA at NBS last fall, titled "Report on Current Knowledge of Shielding From Nuclear Explosions" by L. V. Spencer and J. H. Hubbell. This is a status report which pulls together in one report the essence of what is known about shielding and the sources of radiation. The most significant aspect of this report is the gaps in our basic knowledge which it reveals. We hope it will stimulate research in laboratories throughout the country to provide accurate data to fill in these gaps.

(The document referred to will be found in the files of the subcommittee.)

For quite some time, another large segment of essential information was not available for use on this report because certain details of weapons design were inevitably involved in disclosing complete data on spectra and intensities of radiations.

Early this year, through the support and participation of the Armed Forces special weapons project in the program, the AEC made this classified information available to key staff members of the NBS project. This is resulting in more rapid and efficient progress.

In addition to the gaps in basic input data, a further difficulty is that most of the accurate calculations of radiation penetration had been performed for direct application to reactor shielding problems. The results of these calculations are not sufficiently comprehensive for predicting within reasonable limits the necessary shielding against nuclear weapons.

Both the FCDA and the Armed Forces were relying on approximately solutions, the validity of which was seriously questioned.

For example, in order to arrive at some solution, in many calculations an average energy of seven-tenths of 1 million electron volts was assumed, although it was recognized that 1 component of the radiation which can result from a nuclear explosion has an energy of 11 million volts.

When you bear in mind that the thickness of material necessary to reduce the intensity to half the initial value is $1\frac{1}{2}$ inches of concrete for gamma radiation with an energy of seven-tenths of a million volts, but is 5 inches for 1 with an energy of 11 million volts, you will recognize how a prediction of radiation dose based on an average energy can under many situations be very misleading.

Dr. Spencer will tell you of the progress being made in developing reliable methods and in performing these calculations on electronic computing machines.

The Nevada and the Pacific tests are primarily engineering tests of the functioning of nuclear weapons. Radiological problems are necessarily involved, but mainly to the extent of obtaining quick answers to very specific and limited questions.

With respect to the radiation aspect, much of this kind of information becomes rapidly obsolete as weapons change in size and type because the information obtained can be applied only to situations which are identical to the test in every detail.

Field tests do not supply the kind of basic data which can be adapted to provide insight on general problems and lead to feasible analytical methods for sound predictions of radiation effects. Therefore, the NBS staff have concentrated upon the longer-range objectives of basic investigations and controlled experiments which will develop methods and data useful under a wide variety of practical conditions.

The results will be adaptable with a minimum additional effort, to even radical changes in yield or composition of nuclear weapons which may occur in the future.

Until the basic principles of the simple, uncomplicated situation are fully known and understood, it is impossible to properly interpret and analyze the results of field tests and apply them to predict radiation levels in new or different situations.

For example, a constantly recurring phrase among radiation physicists is "the geometry" of the source or of the shielding. The geometry of a situation is a most significant factor, because not only the material used for protection, but its physical arrangement influences the radiation dose which will occur at a given spot. The height, the distance between walls, the angles, and so forth, all these affect the measured dose. Thus, we speak of "simple geometry" which means that we study what happens in different elementary situations, and from this build up combinations of these simple configurations to obtain the complex structures which occur in practical situations. One of our staff members designed and carried out a "simple geometry" experiment at the Nevada tests last summer. In addition, this month we are assisting the AEC and FCDA in carefully controlled experiments using cobalt-60 sources on some of the small houses at the Nevada test site. Dr. Spencer proposed both these experiments in order to obtain clear-cut experimental measurements which could be used to check theoretical calculations. He will utilize the results of the coming experiment in his computation of the protection factors of small houses.

I would like to emphasize that as a result of recent efforts, we have sufficient knowledge of radiation shielding to assure that adequate radiation protection can be included in the design of shelters when they are to be constructed for this primary purpose.

Where the large degree of uncertainties now occur is in determining the degree of protection offered by existing structures or by new construction where factors other than blast and radiation protection must determine the shape, size, location, and so forth.

I have only touched upon a few of the many phases of the NBS program. We expect that one of the end results will be the prepara-

tion of handbooks which will provide engineers, technicians, and scientists in FCDA and the Defense Department with authoritative methods and data necessary for solving practical problems in radiation physics.

Right now, Dr. Spencer is writing a manual which, among other things, will provide a realistic number for the maximum radiation dose which will prevail in an area subjected to maximum blast pressure of a given number of pounds per square inch.

Mr. HOLIFIELD. Are there any questions of Dr. Taylor?

Dr. Taylor, we are always glad to have you and we appreciate the good work the Bureau of Standards does in this field.

Mr. GREENE. Dr. Louis V. Spencer will speak on penetration of radiation.

Dr. Spencer is a consultant of the Bureau of Standards and he is a teacher of physics and mathematics at Ottawa University in Kansas.

STATEMENT OF LOUIS V. SPENCER, CONSULTANT, NATIONAL BUREAU OF STANDARDS

Mr. SPENCER. As Mr. L. S. Taylor has already mentioned, a project was established at the National Bureau of Standards about 2 years ago to obtain data and to do research on problems of radiological physics relevant to civil defense. The activities carried on as part of this project are diverse; but they mostly relate to the problem of determining the shielding characteristics of existing structures or of special shelter construction. From the beginning there has been a general feeling among the technical people at the NBS connected with this project that a more slowly developing but more basic investigation should take precedence over an attempt to get quick answers to specific questions. Since it early turned out that existing field-test data appeared to call for a better theoretical foundation for its interpretation and application, we have put most of our efforts into an attempt to provide this theoretical foundation and have postponed extensive study and use of field-test data. Perhaps I can best summarize our work by sketching different types of shielding situations that occur and indicating the relation of different parts of our work to these practical problems.

To do this, I should like to differentiate between (a) exposure to the initial radiations from an explosion, that is, those occurring within about the first minute after detonation; and

(b) exposure to the fallout radiations at various times after detonation.

Further, I should like to distinguish four different types of protective construction, namely (1) special shelter construction, (2) existing "light" structures, (3) existing "heavy" structures, and (4) improvised shelter.

Each combination of exposure type with a type of protection represents an area for research.

For example, we may focus attention on special shelters designed to protect against initial radiations. In the present discussion I may refer to this as (A1).

Please realize that there is nothing sacred about this particular breakdown of the problem. There are many approaches. I use this

one merely to provide a suitable context within which different pieces of research may be interrelated. Also, note that some combinations are more important than others; I shall not try to discuss every situation.

II. SPECIAL PROTECTIVE CONSTRUCTION AGAINST INITIAL RADIATIONS

Special construction tends to be more easily analyzable than adapted construction because the geometry is simpler. In particular, almost any shelter of type (A1) will involve a thick protective barrier, and possibly a "maze" of some sort for ventilation or entrance-exit. The barrier is a protection because it absorbs most of the radiation which may be incident upon it. The maze has merely the requirement that radiation must follow a tortuous and unlikely path in order to enter the shelter.

To analyze this situation one needs to know (1) likely radiation intensities incident upon the shelter;

(2) The likely penetration law of the radiation through barriers; and

(3) The characteristic features of penetration of initial radiations through mazes. Actually, in order to make recommendations which may be the basis for expenditure of large sums of money, one also needs to know something about the fluctuations as well. In other words, we should know how much an actual situation can depart from what is considered "likely."

I think we have made and are making considerable progress on this problem. Initially, we ran into difficulties because this early radiation has some dependence on weapon design; and this put relevant data in a classification category unavailable to the project. Since early this year, however, members of the NBS staff have had access to this information, and it is giving us the basis we need to determine all three of the items above.

Determination of penetration through mazes is more of a problem at this point than the other two items. Even the simplest maze schematization requires a knowledge of the "backscattering" properties of radiation, neutrons as well as gamma rays. We are computing these now. In addition, we are setting up experiments to examine at least the maze penetration characteristics of gamma rays. We originally expected a great deal from neutron maze penetration experiments which were performed for reactor shielding purposes; however, some of this data is usable and some is not. We are hoping for more experiments in this area in the near future. Our own laboratory is not suitably equipped for this work.

Mr. HOLIFIELD. Going back to the statement made up above there, "since early this year members of the staff have had access to this information," you are speaking of information kept from you on a security basis up until now?

Mr. SPENCER. Weapons-design data.

Mr. HOLIFIELD. That was kept from you.

Mr. SPENCER. It is in a classification status and is not available to normal civil-defense projects.

Mr. HOLIFIELD. Not even on a need-to-know basis?

Mr. L. TAYLOR. There is an agreement between the Department of Defense, the Civil Defense Administration, and the AEC that has spelled out areas of interest. These do not include information which discloses any weapons-design data.

Mr. HOLIFIELD. When you say "design," you are referring to the component materials in the weapons as well as their size and yield?

Mr. L. TAYLOR. Yes, sir.

Mr. HOLIFIELD. You have been given the yield heretofore, have you not, on weapons?

Mr. L. TAYLOR. I am not sure whether the actual yield information was withheld from us or not, but the mechanism by which the bomb is fired will influence the spectrum that you get from the bomb and without that knowledge you are working very much in the dark.

Mr. HOLIFIELD. Are you talking about the hardware?

Mr. L. TAYLOR. Not specifically the hardware, but you are bound to find out these things as soon as you study one of the reports that contains the information that you want. The problem really became one of sorting out the information which was required for our study from information that we did not need to know about and still providing. Even there the scientist could take the information we did require and work back and find out—obtain information about weapons design that the military obviously did not want disclosed.

This information is not ordinarily necessary, I expect, for a good deal of the work that is called for by FCDA, but it was essential for our work and it took something on the order of a year to find a channel by which this information could be made available.

Mr. HOLIFIELD. It might interest you to know that we have legislation before the joint committee now to make all of this information available to any foreign country that the President decides to give it to, and I can think of some over there that would be just transmission belts to some place else.

Mr. L. TAYLOR. I sometimes think they can get it easier than we can.

Mr. HOLIFIELD. They will as soon as this legislation is passed, I assure you.

Go ahead, Dr. Spencer.

Mr. SPENCER. All things considered, we are in reasonably good shape on this problem. More work needs to be done, but I think it will not be difficult to provide recommendations and criteria for use in this type of construction.

III. SPECIAL PROTECTIVE CONSTRUCTION AGAINST DELAYED RADIATIONS

This problem is very similar to the one outlined above, so long as the special construction does not rely upon the shielding properties of a complicated surrounding superstructure. If a superstructure becomes involved, the analysis becomes much more difficult and is best discussed in connection with the shielding provided by existing buildings.

Protection again will be afforded by a barrier and possibly one or more mazes. Thus the three items already mentioned, namely radiation intensities, together with penetration characteristics in regard to barriers and mazes are again essential information.

I have already mentioned our work on mazes, which applies here also. We have done additional work on the spectrum and on the

penetration characteristics of the delayed gamma rays from fission. Last June two important reports became available which together provide a good foundation for the study of the delayed fallout gamma rays. These reports were written by Drs. Ballou and Miller, both of the Naval Radiological Defense Laboratory.

We have taken their data and produced spectra to be used in computing penetration and backscattering properties of the fallout radiation.

Also, we felt it important to obtain an unambiguous comparison between computed attenuation of this radiation by concrete, and attenuation determined experimentally in a field test. Dr. Titus, of our laboratory, therefore, went last summer to Nevada and conducted experiments in "good geometry" at the test site. We have made the desired comparisons between theory and experiment. They seem to be satisfactory, though we have some additional analyses to perform.

IV. PROTECTION AGAINST FALLOUT RADIATION AFFORDED BY EXISTING "LIGHT" STRUCTURES

The "light superstructure" problem is considered to be fairly well understood, though additional work is needed. In general we expect the basement of a light framehouse to provide a protective factor of the order of 10, while the first floor provides a protective factor of perhaps 3 or 4. A major contribution to the radiation intensity in the basement will come from fallout on the roof. Protection is afforded not by "barrier attenuation," since the radiation easily penetrates the walls, but by the geometric characteristics of the structure—what we call the "solid angle" factor.

A number of things are not so well known about this situation. For example, we expect that, by and large, furniture in a house will not alter the exposures appreciably; but this has not been proved; further, we do not know the accuracy of computations for this situation.

There exist several procedures for calculating the shielding characteristics, but they have been insufficiently examined experimentally. Finally, we know very little about the spatial distribution of the fallout—this is very likely our largest source of uncertainty.

An experimental program is now in progress at the Nevada test site under the direction of Dr. G. Samuel Hurst of the AEC Oak Ridge Laboratory. Representatives of other laboratories are participating in the experiments.

In particular there will be people from our laboratory, from FCDA and from project civil, as well as from AEC.

The objective of this experiment is to obtain needed information on light structures. We helped initiate this work and are acting as consultants as well as participants.

Measurements and calculations will be made for a number of houses at the test site. These measurements will be made in such a way that the estimates they provide can be modified to include new information about the spatial distribution of the fallout. We hope and expect that computations will check sufficiently well with the experimental results to make extensive further experimental work of this type unnecessary.

While discussing this experimental program I should like to mention that one of the primary objectives is to examine item B4, that is, the possibilities for improving shelter in, for example, a light framehouse. We feel that there is considerable importance in knowing whether it is possible to achieve quickly or cheaply a shielding factor of the order of 100 or 1,000 rather than one of the order of 10. This could be most important in a sudden emergency, and it may also have a bearing on decisions to construct fallout shelters. The Nevada program will test some of these possibilities.

There has been a tendency in this area to concentrate attention on the possibilities for absolute shelter which is good enough and then some, and we wish to examine the intermediate situation because fallout intensity from bombs appears to be in a range where protection somewhat less than optimum may be very valuable to have if we know how to get it.

V. PROTECTION AGAINST FALLOUT RADIATION AFFORDED BY EXISTING "HEAVY" STRUCTURES

This is probably the least-known shielding problem and the one most difficult to solve. Large buildings like those of New York City, if they are still standing after a nuclear attack, will certainly provide a good shield against radiation. Perhaps even more important are the downtown buildings of smaller cities and towns, which are not likely to be near a burst.

We know very little about the shielding properties of these structures, with their vents, relatively thick walls, and internal compartmentalization; consequently a great deal of work is being planned in connection with this, as well as some of the other problems already mentioned. The Army Chemical Center is performing experiments to determine the shielding characteristics of a concrete blockhouse with walls and roof of varying thickness. This should give experimental data on the lateral penetration of radiation through thick walls. We are acting as consultants to this work, and we are also engaged in extensive computations leading up to a theoretical analysis of this problem.

We have tried to interest other laboratories in performing an experimental analysis of the effect of internal compartmentalization, the vertical and horizontal partitions in a building.

It begins to look as if experiments of this type will be performed in the near future, possibly at the National Bureau of Standards and possibly at the Naval Radiological Defense Laboratory. We hope to do some computations for this geometry eventually.

We have also encouraged the FCDA to plan for an experimental program to investigate shielding by large, compartmentalized structures. Availability of qualified scientific manpower is a major problem here, as there are very considerable experimental difficulties. We would like to see a program of this type follow closely upon the Nevada experiments now in progress, utilizing the experience gained in this experiments.

The extensive computer programming underway in our laboratory, together with work of a complementary nature at project civil, should provide a basis for theoretical estimates of the shielding factors in these cases.

As a matter of fact, we feel that there is a good chance that the combined theoretical and experimental analysis of this problem will lead to elementary methods for estimating the shielding factors.

The information gained in the study of this problem should aid us in giving better advice to people regarding the most sheltered location in a building.

Our laboratory is engaged in extensive computations of various kinds designed to provide data basic to the determination of shielding factors in practical situations of various kinds. We have also been trying to stimulate other well-equipped laboratories to do various pieces of related research; and we have been working closely with the men of these other laboratories, some of which are project civil, Oak Ridge, the Naval Radiological Defense Laboratory, and the Army Chemical Center.

As a result of all this interrelated work, we have some problems fairly well in hand, notably those relating to special construction in simple geometries.

Further, we are fairly rapidly "closing in" on another set of problems, namely those relating to shielding by "light" structures. Finally, we have begun a full-scale attack on the more difficult "heavy" structure shielding.

The FCDA has asked us to prepare a manual presenting criteria for the construction of shelters protecting against radiation. Even though a great deal of pertinent information still needs to be obtained, we have begun the writing of this material, hoping to complete an initial version of it sometime later this year.

I might just say that I think the situation here is very much the way it was described by Dr. Newmark. We can certainly do a job on constructing shelters by overdesigning somewhat. If we learn more about it, we can save a great deal of money by being able to relax the criteria which are being used.

Mr. HOLIFIELD. Thank you, Dr. Spencer.

Let us have Dr. White on these shelter plans, cost studies and strategic planning, and we will ask Dr. Shepard to put his statement in the record because we are not going to have time for both in view of the fact that we have had an extra witness here.

(The statement referred to is as follows:)

SYNOPSIS OF RESEARCH RELATED TO SHELTER AGAINST RADIOLOGICAL FALLOUT, CARRIED ON BY THE INSTITUTE OF ENGINEERING RESEARCH, RICHMOND FIELD STATION, UNIVERSITY OF CALIFORNIA, BERKELEY, FOR FCDA UNDER CONTRACT No. CD-SR-58-40.

(Presented by Prof. Ronald W. Shephard, faculty investigator, Project Civil)

The research carried on falls within the following four project areas: I. Shelter studies; II. Micrometeorological variations of fallout deposition; III. Statistical studies related to planning of shelter efforts; IV. Biomedical effects of partial exposure in existing structures.

I. SHELTER STUDIES

The research being done on the problem of sheltering civil population from radiological fallout is mainly oriented to investigations of the protective capabilities of existing facilities and structures, by study of basic components needed to make evaluations of protection and the undertaking of a pilot application of these components to some actual urban area.

The individual activities in this area are as follows :

A. A survey of building materials commonly used in existing urban structures

This survey was undertaken to provide basic weight data for building materials, to indicate how materials are used (i. e., the geometric configurations of building components), and to estimate the predominance of various uses.

B. A survey of the sizes, weights, and locations of equipment and stored goods in light industrial plants

These data were gathered for estimating the protection afforded by the contents of light industrial plants to persons seeking shelter in such structures. Models for various kinds of manufacturing were constructed on the basis of statistical data contained in the Census of Manufacturers and Annual Survey of Manufacturers, using standard manufacturing procedures.

C. A computation method for gamma-radiation intensity in the presence of general shielding and source configurations

This digital computer procedure provides a rapid method of calculating, for thin-walled structures (light frame), the gamma intensity at arbitrary points within a complex configuration of sources (distribution of fallout particles), shields (distribution of structural mass), and detectors (potential locations of people).

The computation involves use of a buildup factor to account for scattered radiation reaching a location within a structure and treats the gamma radiation spectrum as monoenergetic or representable by discrete energies whose contributions may be calculated individually and subsequently summed.

The source is taken as a radiation field distributed over 3-dimensional space, in any way desired, to represent fallout particles descending in air, or distributed on 2-dimensional planes or surfaces, or along 1-dimensional lines and curves, so that actual configurations of radiation energy associated with fallout may be realistically represented.

For photons of various energy levels, shielding materials are represented by distributions of the corresponding coefficients of linear absorption over three-dimensional space. Individual shields, that is, structural members, are represented by regions of space throughout which the absorption coefficients have a constant value.

This computing procedure was devised for the purpose of rapidly investigating the influence, on attenuation, of parameters describing various distributions of fallout particles and structural mass. As will be indicated below, the procedure also provides a method of calculation to be used in the statistical estimation of the protection afforded by existing structures in an urban area. It allows a treatment of the geometry of solid angles through which radiation may reach a point within a structure, corresponding to assymetries of fallout deposition and distribution of mass within the structure.

The use of a buildup factor appears to be appropriate only for thin-walled (light frame) structures. The work being done at the National Bureau of Standards, described elsewhere in these proceedings by Dr. Lewis Spencer, will provide a partial basis for considering modifications of the procedure to make it appropriate for thick-walled structures. In the near future such modifications will be undertaken on the basis of the results of the research at the National Bureau of Standards and other activities at project civil described in paragraph G below.

D. Experimental check of attenuation estimates provided by the project civil digital computer procedure

With the assistance of AEC, experiments will be performed during May of this year on actual structural geometries of houses at the Nevada Proving Grounds, to measure attenuation of radiation at various points within the structures for comparison with calculated values obtained from the digital computer procedure.

E. A statistical design to estimate, for urban areas, the amounts of floor area providing various degrees of attenuation of radiation and the population accommodable therein

This statistical procedure was formulated as a basis for estimation of the protective space provided by existing urban structures against the contingency of radiological fallout. The procedure yields an estimate, for particular types of

structures, of the total areas providing at least some specified degree of attenuation. The exact locations of the protective areas will not be obtained for all structures of an urban area. However, in compiling data for the statistical estimation, it is expected that rules of thumb will be found for indicating the likely locations of safest regions.

The estimates of attenuation may be obtained, in the absence of exact knowledge of the asymmetries of the distribution of fallout particles, by assuming uniform distribution of fallout particles and associated energies, and assuming that actual asymmetries will average out.

The sampling procedure is based upon the use of Sanborn maps and tax assessors' records for the physical characteristics of structures, supplemented by the survey of building materials commonly used in existing urban buildings, described in paragraph A above. First, a large sample of structures will be drawn from an urban area. For all such structures a rough and ready estimate of the areas providing various degrees of attenuation will be made. Then, with such estimates, a final relatively small subsample will be drawn for a refined estimate of the attenuation areas, using the digital computer procedure described in paragraph C above. Finally, on the basis of the refined estimates for a few sample structures, the total areas providing various degrees of attenuation will be estimated for all urban structures.

For the estimation of the population that can be accommodated in a given urban area, there are two extreme situations which bound the practicably feasible possibilities:

(a) Individuals may be accommodated only in the structures in which they are normally located at the incidence of fallout.

(b) On the basis of some geographical partitioning, commensurate insofar as possible with equal areas of feasible movement for seeking shelter, the population within such partitioned areas may be assumed to be sheltered within the structures located therein.

Estimates can be made for both of these extreme situations.

F. Pilot application of the statistical procedure for estimating the amounts of floor area providing various degrees of radiation attenuation

During the summer of this year a pilot application of the statistical methods, described in paragraph C above, will be made for the thin-walled structures of Contra Costa County, Calif., for the purpose of developing detailed procedures which may be used by local and State governments for similar estimations.

G. Investigation of the attenuation of radiation afforded by existing heavy-walled structures of urban areas and potential modifications which may be made to such structures for attainment of necessary shelter against radiological fallout

The research in this area will be initiated during the summer of this year. It will be composed of the following subprojects:

(a) Experimental investigation of the transport of radiation as a function of direction and energy in several, simple, bounded, heavy-walled structural geometries, to develop an understanding of the scattering of radiation through complex structures and seek approximate methods for estimating attenuation afforded by heavy-walled structures.

(b) Investigate the possibilities of model studies, and the related scaling laws, to reduce the enormity of prototype examinations required for estimation of attenuation afforded by existing, heavy-walled urban structures, to determine the conditions under which scattered radiation may be approximated by a buildup factor, and to seek a modified approximating treatment when buildup factors may not be used.

(c) Modify the digital computer procedure, described in paragraph C above, for estimation of attenuation of radiation provided by heavy-walled complex structures.

(d) Develop rules of thumb for best locations of population in existing, heavy-walled structures and study the possibilities of simple modifications of existing structures to enhance the attenuation afforded, under various conditions of radiation intensity and distribution of fallout on and around the structures.

II. MICROMETEOROLOGICAL VARIATIONS OF FALLOUT DEPOSITION

In the evaluation of shielding afforded by existing structures of urban areas, the distribution of fallout on and around such structures is strongly dependent upon micrometeorological factors. Also, the decisions on ideal locations of construction of new shelters or alterations of existing structures will depend upon such micrometeorological characteristics of fallout deposition. The resulting asymmetries of deposition, although possessing random characteristics in part, will have certain trends which strongly influence the potential shielding afforded.

The individual projects in this general area of activity of Project Civil are:

A. A theoretical study of the dynamics of fallout particle transportation by the mechanism of atmospheric turbulences

The statistical theory of isotropic turbulences will be modified to include the effects of density and velocity gradients characteristic of atmospheric conditions in the frictional layer of the earth's atmosphere. In particular, a theoretical study will be made of atmospheric turbulences associated with the flow of air around typical urban structures and the dynamics of fallout particle transportation associated therewith. The object of this project is to provide a theoretical basis for the support of the projects listed below.

B. Experimental study, in a low velocity, large diameter wind tunnel, of the deposition of fallout particle simulants around and on model structures

A variety of wind velocities, model sizes, and spacing of models will be used to investigate scaling laws for estimation of asymmetries of fallout deposition around and on real structures of an urban area. The trends of asymmetries of deposition will be investigated by these experiments. Also, the possibilities for use of windbreaks around strategic structures for passive control of fallout deposition will be investigated by model studies in the wind tunnel.

C. Investigation, by field studies and laboratory experiments, of surface wind patterns, particularly the anomalies which may be characteristic of topography

Work on this project is contemplated for the future in cooperation with the California Forest and Range Experiment Station and the United States Weather Bureau.

D. Field measurements of the deposition of industrial waste particles simulating the aerodynamic properties of fallout particles

This research is planned for large-scale verification of the theoretical results obtained in the projects listed immediately above, and for investigation of random variations. Work on such field measurements is contemplated for the future, when results have been obtained upon the other subprojects in this general area of research undertaken by Project Civil.

E. Influence of fire-induced convection columns on the deposition of radioactive fallout particles

An analytic and experimental study, on a laboratory scale, of the influence of fire-induced convection columns on the deposition of radioactive fallout particles has been undertaken by Project Civil under a subcontract to the California Forest and Range Experiment Station.

III. PLANNING OF SHELTER EFFORTS

An IBM 701 program for computing data to plot isointensity, isodose contours for various levels of probability, using climatological data on the statistical distribution of winds and idealized fallout patterns, has been developed at Project Civil and a case application of this program has been made for the San Francisco Bay counties, for both summer and winter conditions. The case application illustrates how isodose and isointensity contours may be plotted for evaluation of radiological hazards and planning of shelter efforts against fallout. For evaluation of radiological problems in a larger region, a case application has been computed for the 11 Western States.

Such methods of determining probability distributions of fallout intensities and integrated doses are being applied by other FCDA contractors in operational studies of radiological defense. Project Civil providing assistance on such applications and undertaking pilot operational studies which may be applied by other contractors on a large scale. Areas of maximum risk of fallout radia-

tion are estimated for various multibomb attacks, and related to population and essential services.

Rudimentary systems now exist for macroscopic prediction of fallout intensity contours, solely on the basis of burst data and local meteorological conditions at the time of burst. A study of the capabilities of such systems for use in shelter warning will be undertaken in terms of a stochastic model of the macroscopic characteristics of fallout deposition, as opposed to the deterministic fallout models used in atomic weapon field tests, because the upper winds affecting the transport of fallout particles are known, during the period of fallout deposition, only in terms of statistical distributions.

IV. BIOMEDICAL EFFECTS OF PARTIAL EXPOSURE IN EXISTING STRUCTURES

A study is now being made at project civil to evaluate partial exposures, over time, of varying intensities of external radiation received by critical organs from different directions. These energy absorptions will be related to biomedical effects. The basic purpose of this study is to provide a more suitable measure of fallout radiation effects from external sources, for partial exposure in shelters, than that presently available in terms of "whole body radiation."

Mr. HOLIFIELD. Can you put Dr. White on at this time?

Mr. GALLAGHER. Yes.

Dr. William White of the Stanford Research Institute. His title is Assistant Director of Economics Research.

Mr. HOLIFIELD. Dr. White, are you one of those who is going to catch a plane?

Mr. WHITE. No, sir.

Mr. HOLIFIELD. Wait then just a minute. Dr. Shephard is going to catch a plane.

Dr. SHEPHARD. No, sir.

Mr. HOLIFIELD. How much time will it take for your presentation, sir?

Mr. WHITE. Let me try to shorten this somewhat and give you the pertinent points.

Mr. HOLIFIELD. Are you located here—you are not located here in town, are you?

Mr. WHITE. No, sir; I am not. I will, however, be in town later next week.

Mr. HOLIFIELD. You will be here next week?

Mr. WHITE. Yes.

Mr. HOLIFIELD. We wanted to go into cost effectiveness studies at some length. I do not know whether you are prepared to give us very much information on that or not.

Mr. WHITE. I can give you some general information on it today, certainly.

Mr. HOLIFIELD. All right.

Let us proceed, then, with your presentation. We will go for at least 30 minutes and then we will have to adjourn.

STATEMENT OF WILLIAM L. WHITE, ASSISTANT DIRECTOR OF ECONOMICS RESEARCH, STANFORD RESEARCH INSTITUTE

I would like to discuss today the contributions which research can make to shelter program planning. For the past 8 years we at Stanford Research Institute have conducted analyses of the United States target system and, in recent years, a number of studies of passive defense measures. For purposes of illustrating the importance of research as a preliminary to planning a shelter program, I will

describe some of our past work for FCDA and suggest a few of the problem areas where further research will play an important role in the future. My remarks will be made from the standpoint of shelter programs as a part of a national survival system based on shelters. The effect of a shelter program on the problems of survival after an attack can be illustrated as follows:

If we sustain a massive attack on the United States without shelters, the problems may be relatively simple, since although many resources which support people will be destroyed, people will be killed in proportion. A gruesome balance between survivors and the things they need would be established in a relatively short time. As we build shelters, however, the problem becomes more complex. More people than resources survive the initial attack or attacks. We increase our responsibility to the survivors in ways which shelters alone do not solve, and a survival program takes on new dimensions.

We can best discuss the subject of shelter research, then, in the context of a survival system of which shelters are the key element. To provide an adequate system, we must identify those elements which supplement shelters, and we must consider each of them carefully, no matter how far afield from shelter any of them may seem to be at the outset. It is not necessary to identify all of these elements here, but we should have a few examples upon which to proceed. We think first of shelters as some sort of a structural unit to protect against blast or radiation. We think of its protective aspects and quite naturally its accommodations for comfort, sanitation, getting people in and out—all of these things have been explored in some detail. But we must also consider the shelter as a part of a postattack environment which, among other things, may include residual radioactivity from fallout. The shelter itself may be adequate protection from such radioactivity, but how do we best use it in this environment? To gain some insight into this problem we must consider the shelter as part of a radiological defense system. Radiological monitoring and communication, at first glance a separate subject, become closely linked to shelters as a part of a survival system. Other elements which may appear to be even further removed from shelter, but which are nevertheless essential to the success of a radiological shelter system, are food, relocation centers, fallout prediction, stockpiling, education organization, transportation, and legal and administrative considerations.

We have all heard the statement that we have enough knowledge to build a shelter program in this country now. I think that this is literally true. It is certainly true from the standpoint of construction. Naturally, there are a few more things that would be desirable to know—there always are. But we could construct shelters that would afford adequate initial protection to the populace. However, as we move further from structural aspects to the use of shelters, the quantity and quality of knowledge decreases. Specifically, we do not know enough about the conditions we should establish in the shelter to make it habitable for relatively long periods of time. We do not know enough about the placement of shelters which would supply the best degree of protection against the various types of attack that an enemy might employ. We have not explored sufficiently some very subtle and difficult questions of how such a program interacts with our active defenses or how the passive defense program, of which

shelters are a part, interacts with active defense to contribute to our total national policy of deterrence. We will discuss these points further in the following sections of this paper.

Research has an important contribution to make to these and other points. Before we get into specific examples, let us try to make it clear how this contribution is best made. The function of research is to make critical and exhaustive investigations, usually with the aim of the establishment of a conclusion or with the revision of an accepted conclusion in the light of newly discovered facts.

In the area of shelter-program planning the function of research is to uncover facts, to reorder them, to test hypotheses, and, therefore, to provide the planner and the decision maker with valid, tested, factual information upon which decisions and plans can rest. It is not the function of research to make plans or decisions, but to provide a service to the functions of planning and decision making. We cannot say that occasionally a plan, clear and self-evident, does not become apparent as the result of ordering facts or testing hypotheses, but this is the exception rather than the rule. The more usual instance involves a test of hypotheses, the examination of alternative actions or allocations of effort, and the presentation of results of these tests and examinations so that the planner or decision maker can exercise his functions and prerogatives.

In our work at Stanford Research Institute, we have observed that there are 3 levels of research important to the shelter-program planner and decision maker; they range from the rather specific study of, for example, how to design a shelter for a particular overpressure, to studies of the broad policy problems of relating shelter to active defense. There are other levels and, as is usual when one tries to set up categories, there is considerable overlap between these levels. We find it convenient, however, to characterize our work at Stanford Research Institute as follows:

Traditionally the functions of research include not only investigation but development of methods and techniques for investigation. The problem of defense against nuclear weapons is a new one and requires new tools. Many times it is also necessary to study specific parts of the overall problem.

The methods, techniques, and knowledge developed in the specific studies are combined for use in analysis of systems and operations from the standpoint of their cost and effectiveness.

Research methods and techniques can be used to examine the consequences of alternative policy decisions in a quantitative manner, and to explore the interrelations of various defense programs.

To make these distinctions clear, we have illustrated each category with an example of each of these types of research from studies that have been conducted by Stanford Research Institute.

Let me try to characterize then the kind of research that can contribute to this sort of a program. We characterize ourselves as research people. We are trying to provide inputs to the planners and decisionmakers. We do not fancy ourselves as planners and we are not trying to usurp the prerogatives of the decision maker, but we feel we can, through the types of analysis we can and do perform, provide valuable information to the planning and to the making of decisions.

Mr. ROBACK. Mr. White, you couldn't usurp that function if you wanted to; could you?

Mr. WHITE. I think you are right, sir.

Mr. ROBACK. Maybe you are putting in plenty of input and you are getting no decision and the stuff is backing up on you.

Mr. HOLIFIELD. This program has had input in it now for 10 to 12 years to my personal knowledge and we are beginning to look for some output. We have had nothing but input—studies and research and so forth. While we are the last ones to say that research and studies aren't necessary, we wonder if they are going to continue past the time when we will have a nuclear war. All of our research will be useless unless we get some product out of it, some output as well as input.

Mr. WHITE. I think I would be the first one to agree with you there, sir. We, too, I feel, have some sort of responsibility in this direction as researchers as well as citizens.

Mr. HOLIFIELD. We are getting tired of putting millions and millions of dollars into this, \$30 million, \$40 million, and \$80 million a year, and getting nothing but studies and research and no effective plan to save the American people from a nuclear holocaust if it occurs. This goes on year after year after year and we are called upon to provide millions of dollars and we come up with recommendations for additional studies, and there is no utilization of the results that have been accumulated by research and study.

Mr. WHITE. Let me go back to one point, sir.

Mr. HOLIFIELD. I am not saying that this is your fault, so I don't want to disturb you in your presentation.

Mr. FASCELL. I would like to ask him a question at this point, Mr. Chairman, and see whether or not I understand the intent of what he said.

Mr. HOLIFIELD. Go ahead.

Mr. FASCELL. Would the results of the research being carried on limit the area within which the planners and policy people must operate?

Mr. WHITE. No, sir; I don't think I implied that at all.

Mr. HOLIFIELD. Proceed.

Mr. WHITE. Let me refer to one of the points again in the early part of my statement. The early part of my statement says we are in a position now to proceed with the shelter program; this statement has been made. I believe that it is literally true. We could institute a program right now to protect people against an initial attack. However, there are many more aspects to a shelter program which we should and must study in order to get an optimum program.

With that as an introduction—well, what are the research techniques? I have said that this is a problem that requires some new tools for solution. Background information vital to planning of shelter programs is developed in part by assessing the effects of nuclear attack on population targets. Three years ago the problem of assessing the effects of attack with area destruction weapons was a new one. At that time, FCDA engaged Stanford Research Institute to develop a national damage assessment system. This system uses electronic computers to interpret the effects of weapons on the population, housing, medical facilities and personnel, and resources (such as water, electric power, fuel) important to the population.

Development of the FCDA system paralleled that developed by the Office of Defense Mobilization for the industry of the Nation. The

two systems complement each other to give a rather complete picture of the physical damage which might occur to the Nation in event of attack. The FCDA damage assessment system may be used to estimate the number of people saved by a shelter providing given levels of protection against the various phenomena of a weapon burst. It is a fine research tool for shelter planning since it can be used to estimate the effects of blast, radiation, and fallout results from various weights and types of attacks upon the country. Such estimates establish the need for protection in quantitative terms. Where shelters are planned, their efficiency in saving life and protecting property can be determined for any type of attack with nuclear weapons by testing the proposed program with the damage assessment system.

Examples of other problems which may be answered with research of this nature are as follows:

1. Further research into weapons phenomena such as the probable half life of the fission products of enemy weapons.
2. Further development of information on soil conditions and their effect on shelter, available land for shelter sites, and so forth.
3. Better estimates of probable warning time and the response of population to warning.
4. Research on shelter habitability requirements considering both physiological and psychological health as they are affected by occupancy time, space, equipment, food, air, and water, and so forth.

Let me point out something else here in conjunction with Mr. Greene's testimony. The information on fallout which is necessary to planning a radiological protection program has been available to put into the damage assessment system only over the last 2 or 3 years. So here was a new problem, with new dimensions, which we had to tackle. We did not have this problem in the days of nominal yield weapons where the only important elements were blast and initial prompt radiation.

Mr. FASCELL. Why can't you start out with the assumption that everybody will be killed and everything will be destroyed.

Mr. WHITE. Why can't you start out with this?

Mr. FASCELL. Yes, sir.

Mr. WHITE. Nowadays, one can almost make this assumption when figuring the weight of attack.

Mr. FASCELL. Isn't that the only damage assessment you need to start from?

Mr. WHITE. No, sir; I don't think that is literally true. Everybody is limited by the number of weapons they can put into a country and the number of carriers they can use to transport these weapons. This applies to us—

Mr. FASCELL. If you start on that assumption you have such a group of variable factors that you would never arrive at a reliable estimate of anything, would you?

Mr. WHITE. You can very well do this, and this is an area that I have to be relatively careful of in later parts of our discussion. We try to make these tests as realistic as we possibly can, but even with the very large attacks that we can imagine today, we don't lose the whole country either through blast or fallout so the question is not one of assuming immediately that everybody is killed to start with and working up from there, but how much of the country may

be affected under different conditions of attack and how we best protect against a logical threat.

Mr. ROBACK. This damage assessment system is a computer method of relating certain assumptions of destruction area to given population and other data?

Mr. WHITE. That is correct. The only refinement I would make in your statement is that the system relates to the effects of weapons over distance on the population and the resources that are important in the country.

Mr. FASCELL. Let me ask you a question at this point because I am not clear in my mind why we are doing all this: Is the purpose of this to arrive at a conclusion as to what is left in the way of people and resources?

Mr. WHITE. No, sir.

Mr. FASCELL. Then what is the purpose of it?

Mr. WHITE. Two things. One, we want to interpret the effects in physical terms—and by this I mean blast, initial radiation and fallout—on the people of the country and the things that support them. Let me stand on that statement. It would appear you have another question you would like to ask to clarify this a little bit.

Mr. FASCELL. No, that is all right, go ahead. I will try to follow you here very closely.

Mr. WHITE. Well, let's move on. I feel somehow that I haven't established this point in your mind in any way of the importance of such assessment of possible damage to the United States—

Mr. FASCELL. I will assume that it is important. You go right ahead.

Mr. WHITE. Let's go on then to another sort of analysis, and another one to which damage assessment is basic and give some examples of analysis of operations.

Analysis of operations has as its objective the determination of the effectiveness of some activity or action, in this case a civil defense measure. It can be conveniently divided into two parts—background studies and operations analysis. The purpose of the background work is to investigate the various measures, operations, or tactics so that they can be analyzed.

When we make an analysis we do not like to introduce assumptions but we like to introduce facts into an analysis.

Examples of such studies which have been made are those on shelter cost, evacuation, dispersal, radiological defense systems, warning and communications systems. Once the measures and their variations are understood, they can be tested and compared. The number of casualties prevented per dollar expended is a second measure.

Mr. ROBACK. You identified the civil defense operations in your analysis?

Mr. WHITE. By this we mean the operations or the tactics. We might say of civil defense being shelter, evacuation, warning. These things are subject to test.

Mr. ROBACK. If the question were put to you, what are the operating functions of civil defense?

Mr. WHITE. We are not in the business of answering that type of question really.

Mr. ROBACK. It would have some bearing on the problem of whether you can identify an operation as to what kind of organization they have. Next week this committee will consider that problem, but I wanted to find out whether in your reference to the operations you understand what civil defense operations are.

Mr. WHITE. I think we understand the tactics that civil defense must use to perform its functions to a pretty fair degree. I would say that though the understanding of and the testing of different operations tactics and problems you discover in testing may give some insight into organization in the operations per se, and many times—

Mr. ROBACK. Has your institute ever been called upon to determine what agencies might perform civil defense operations in the Federal Government?

Mr. WHITE. No, sir, we have not.

A study of the effectiveness of radiological defense measures will serve as an example here. The objective of this study is to establish the cost and effectiveness of various radiological defense measures in order to provide FCDA with data for program planning and financial planning. This study is divided into two parts. The first is a derivation of the cost of various radiological defense measures designed to meet various conditions of fallout. These measures might range from modified basement shelters to specifically constructed shelters and decontamination procedures. The second is a test of various combinations of these measures by means of several simulated attacks on the country assuming that various combinations of radiological protective measures are used. The latter step allows us to derive the effectiveness of various measures for which cost is known. Examples of other problems which may be answered with research of this nature are as follows:

1. Analysis of the cost and effectiveness in meeting the long-term objective of the Nation of various civil defense systems, including shelter, evacuation, radiological defense, stockpiling, and dispersion.
2. Evaluation of the influence of probable warning times, as determined by enemy capabilities and tactics, on the effectiveness of passive defense systems.
3. Determination of the effects of passive defense programs on the economic, political, and social welfare of the Nation.
4. Analysis of mobilization plans of various Government agencies to determine their relationship to FCDA plans.
5. Investigation of the lead times required for the various passive defense programs and the influence of these times as related to the lead times for the enemy threat and for the other defense measures.
6. Research on optimum placement of shelter of various qualities in accordance with risk of receiving various levels of fallout.
7. Research on a system of fallout shelters to combine all elements important to a functioning radiological defense program.

Mr. ROBACK. Have you related these cost analyses to any kind of index or relative value in the civil defense program? For example, have you done this in the event you spent \$100 million in stockpile as against \$100 million—

Mr. WHITE. There are two kinds of relationships that crop up here and one of them is the specific example that you used.

Shelter and stockpiling programs are very closely related, as I intimated in my opening statement. If we do not have shelters we

do not have to worry too much about a certain kind of stockpiling. If we do have shelters, then stockpiling may become a very important problem but the problem here then is what do you stockpile.

Mr. ROBACK. Will these studies be related to some kind of a budget program so there will be some scale of military priorities in what you want to do?

Mr. WHITE. Only roughly as far as we are concerned. It is the function of FCDA to put these things together in their own operations analysis group and other groups in the organization, on the basis of the results of our study.

Mr. HOLIFIELD. Do they furnish you with certain alternative programs to study?

Mr. WHITE. We are furnished with alternative programs and sometimes are able to suggest alternatives ourselves.

Mr. ROBACK. Have you made any recommendations about the stockpile program?

Mr. WHITE. We have a study going on on this at the present, both FCDA and our thoughts on this problem have changed somewhat over the past years.

Mr. HOLIFIELD. How long have you been studying it?

Mr. WHITE. This particular one has only been underway effectively for about 4 weeks or so.

Mr. HOLIFIELD. I think you said that your thoughts had undergone changes over past years.

Mr. WHITE. This is the first time that we have had a concerted study on stockpiling. Previously we had produced data more or less on the basis of the biological requirements of people, or more specifically, survivors.

That is they (the survivors) need so many calories a day and we have looked at the problem of "do these calories exist in gross amounts some place?"

There are some rather interesting answers here in terms of surplus and deficit areas under various conditions of attack.

Mr. HOLIFIELD. What is the difference between that kind of a study and a concerted study?

Mr. WHITE. What we are trying to look at now is not only this problem, but that of stockpiling where we store material for years with the chance of an attack occurring. We are trying also to take into account the availability of balances of food in terms of undamaged area and undamaged production.

We are also trying to take a look at what we are trying to achieve in stockpiling programs.

Mr. ROBACK. Do you have a separate contract for stockpiling or is that a part of the blanket contract?

Mr. WHITE. It is one task of a blanket contract.

Mr. ROBACK. The stockpiling consideration would be relevant for example to a mass casualty treatment program, would it not?

Mr. WHITE. Very definitely.

Mr. ROBACK. So, if the American Medical Association is studying that problem, in what sense or to what extent will they have available, since these are concurrent studies, your recommendation? In other words, will they come up with a program which may conflict, or not take into account your findings?

Mr. WHITE. I doubt it very much, sir, since we have been in touch with the AMA and all the other sources that we can identify that are interested in this program both through FCDA and on our own. They know that our studies are going on, we know that their studies are going on. There is just too much effort being spent in this area to duplicate or not to use something that is available.

Research can also contribute to broad policy decisions. The work discussed so far has been largely directed to the choice of alternative measures important to planning specific programs. Planning such programs is the province of the operating elements of the civil defense organization. In order that the various programs may be related and emphasis given to the most effective programs, overall planning is necessary. Research can contribute to the overall planning by instruments such as a strategic framework.

The primary function of the strategic framework is to present the civil defense policymaker a framework within which to evaluate potential civil defense measures. The strategic framework is a systematic means of relating the various elements directly affecting civil defense. The elements with which the civil defense policymaker is primarily concerned are:

1. The United States target system.
2. The United States active defense capability.
3. The United States passive defense capability.
4. The United States warning system.
5. The enemy attack capability.

Since the civil defense planner is further interested in the contribution of civil defense programs to the national policy of deterrence, he is also interested in the four elements of deterrence:

6. The United States attack capability.
7. The enemy target system.
8. The enemy active defense capability.
9. The enemy passive defense capability.

An integrated, time-phased analysis of these nine elements permits:

(a) Interpretation of the enemy threat over a period of time in terms of its possible effects on the elements of population, resources, and Government for which FCDA is responsible.

(b) Interpretation of the enemy threat over time as it directly affects passive defense activities.

(c) Interpretation of the capabilities and implementations of active defense actions as they affect passive defense actions.

(d) Assessment of the effectiveness of integrated passive and active defenses to counter the enemy threat.

(e) Assessment of the effect of passive defense on the survival of the country.

(f) Determination of the place of civil defense activities in the country's strategic planning.

(g) Indication of feasible objectives for civil defense plans and operations.

In summary it should be noted while research has solved many of the shelter problems relating to the structural requirements for protection from blast and fallout, there are still areas of research which must be pursued in order to obtain the maximum benefits from a shelter program. In general these problems involve relating shelter

programs to other elements in the strategic situation—active defense, SAC, and so forth, developing each of the components of a shelter system, and scheduling the program over time to test its effectiveness in meeting the threat at that time.

Mr. HOLIFIELD. Are there any questions of Dr. White?

Mr. LIPSCOMB. Dr. White, how many studies is the Stanford Research Institute doing for FCDA?

Mr. WHITE. At the present time there are about four major tasks under way in the present contract. There are four tasks upon which two or more people are engaged, at the present time for the agency.

Mr. LIPSCOMB. How does the study come about, do you suggest it to FCDA under a contract or do they come to you and ask you to make it?

Mr. WHITE. This is a mutual endeavor. We have been engaged in working with the agency now since about 1954, and as methods and techniques are developed, other problems which have been apparent have become soluble. New problems occur with the advance of weapons technology that we did not have before. So it develops I would say about 50 percent on each side.

There are many things that we see and suggest and many things that FCDA sees and suggests.

Mr. LIPSCOMB. How many people do you have on your staff that work on the FCDA problems?

Mr. WHITE. About 12 fulltime professional people.

Mr. LIPSCOMB. Can you name any studies that have been completed and turned over to FCDA?

Mr. WHITE. I can name many studies that have been completed and turned over to FCDA.

The first one that I might bring up because it goes back to the first of our present contract, are those volumes which apply to the National Damage Assessment System. This computation scheme—this is almost literally a 4-foot shelf of books, including a national damage assessment code which locates the population and resources of the United States. It includes manuals for computation of various types.

I am going through just the last year's work, for instance.

Mr. LIPSCOMB. Can you tell me what FCDA did with that study? What use it was put to?

Mr. WHITE. Yes, sir. You know of the various exercises—first of all, FCDA is using its own planning now, using the damage assessment system and we have turned this over to them—I am trying to think of something lock, stock, and barrel—but this would include the punchcards for the electronic computer, the program manuals; we have turned these over to the headquarters and the seven regions of FCDA who may use them locally for not only things like Operation Alert which is run every year, but also for a basis for their own planning.

Mr. LIPSCOMB. Are we going to have an Operation Alert this year?

Mr. WHITE. That is my understanding.

Mr. GALLAGHER. Yes. It will be in two phases. The first phase is next week.

Mr. LIPSCOMB. Do you use this study that he is talking about?

Mr. GALLAGHER. Yes, sir. We use the system for analysis of local problems and for assessment of the national situation.

Mr. LIPSCOMB. And how does this benefit civil defense? How does this give Los Angeles a better civil defense program?

Mr. GALLAGHER. You are asking me, Mr. Lipscomb?

Mr. LIPSCOMB. Well—

Mr. GALLAGHER. Generally I should say with regard to the use of the damage assessment system—and this goes to Mr. Fascell's question—that it comes down to an understanding of what resources remain after attack, what you must do in the utilization of resources and the protection of resources and the protection of people. As you say, sir, one of the firm conclusions that comes out of this kind of theoretical analysis is the support of a need for shelter.

You come to that conclusion that you must protect the people with shelter in order to have an operable country in any degree after an attack, in terms of an attack that we can foresee.

I would not agree we have a complete destruction of the country. It is a relative thing.

You have to take steps to protect these resources, to supplement these resources. You must plan for the stockpiling of resources—whether or not you have funds to do it with, you must look at the problem. It comes down to a continuous assessment and this problem changes. The nature of the attack has changed over a period of time, the possible attack. You do assess where you would be after an attack and what you ought to do about it. It is as simple as that.

It has to do with the use of resources and the supplementation of resources.

Mr. LIPSCOMB. How has this information been disseminated to the field, like the regional headquarters in California, and then down to Los Angeles? Or are all these studies in the Battle Creek headquarters?

Mr. GALLAGHER. No, as Dr. White says, we have put this capability into our regional offices for them to make their own assessments of the regional situations, with the local aspect. The assessment at the national level is in gross terms, on a national basis. So that the regions are developing their own capabilities to make more definitive regional assessments or State assessments or local assessments.

Mr. FASCELL. Will the gentleman yield at that point?

Mr. LIPSCOMB. Yes.

Mr. FASCELL. Then as I understand it, given the nature of an attack, you could use a code factor to set out in this assessment manual and arrive at an estimate of what you are going to do afterward?

Mr. GALLAGHER. That is correct; yes, sir; and the system is of importance before attack for war-gaming the situations and coming to some conclusions as to what you ought to do in anticipating these attacks.

Mr. FASCELL. Understanding, of course, that at all times all of this would be basically an approximation, but it is better than not having anything at all.

Mr. GALLAGHER. You are precisely right, sir.

Mr. WHITE. I might say, sir, you can do another thing with this, too. Since it is an electronic computation and it is rapid and inexpensive, you can try a lot of different attacks and see, first of all, what are the important things that might happen during attack, and

which things are common to all types of attacks. You can see things that come out of the problem.

Mr. HOLIFIELD. Did you folks do much of the same kind of study for ODM?

Mr. WHITE. No, sir, but the ODM assessment system was developed in parallel to ours and, as a matter of fact, from the beginning clear through until the systems got ready to be used, they grew in parallel, with a common steering committee that worked with the two programs.

Mr. GALLAGHER. It would be fair to say, however, the developments in the FCDA system contributed to the ODM system; is that not correct?

Mr. WHITE. That is correct.

Mr. ROBACK. Do they use the same code techniques, do you know?

Mr. GALLAGHER. They are, as a matter of fact, merging the resources file. They are having to convert from the card records to a tape record, but there is going to be a melding of the two resources files.

Mr. WHITE. Other things that were complete last year that might be of some interest, we have a study on the postattack food situation; a study of public response to evacuation orders, which is a very important point in a shelter program.

Mr. LIPSCOMB. Is that still a valid study?

Mr. WHITE. I think so. This is but an opinion, and my own opinion, but I don't think the state of urgency has increased sufficiently in the last 6 months to invalidate the results of the study that was completed about that time.

Mr. HOLIFIELD. What were the results of that study?

Mr. WHITE. I hate to try to characterize this roughly, because we do have some real—or at least some estimates—I was going to say real numbers, I should say estimates, on this subject.

As I recall, a gross estimate of the answers here were that you would not expect very much reaction to evacuation orders in, say, the first 15 or 20 minutes; that it would be something on the order of an hour before the evacuation got rolling, and we also tried, on the basis of the reaction of people to accidental alerts that have occurred, to estimate the number of people who would move in the event of this type of an alert. The number of people who will move amounts to, as I recall, something like about 80 percent of the population, but over quite a period of time.

Mr. FASCELL. Was this in response to a direct question like "Will you move if the whistle blows?" or "Will you move if the bomb drops?"

Mr. WHITE. No, it was not. We tried, rather than using survey methods here, to assemble data from accidental alerts, from things like the Marysville-Yuba City flood experience, which gives us some insight into things of this type—actual occurrences, as near as we can get, on the conditions that might prevail.

Mr. HOLIFIELD. Well, of course, this committee has made a study of this over a period of several years, and I figure it would be wasting your time and ours, too, to carry this type of questioning much further.

Mr. Gallagher, we are short of time, as you know. We appreciate the testimony that has been given, but we haven't yet been given any testimony on the 1957 shelters and the respective costs of those shelters, and this is one of the things that we had hoped to get out of this. Is it because you don't have those?

Mr. GALLAGHER. No, sir, we expected fully that there would be questioning on this. We have rather complete data on all of those structures. It might serve your purpose if we provided this to the committee, or we can—

Mr. HOLIFIELD. I think I will ask the staff to confer with your staff on this matter and we may have to arrange for another hearing on this, in view of the fact that we haven't received anything of this type. We have had all types of information given us on 1951, 1952, 1953, and 1955 shelters, and we haven't had anything given us on 1957 shelters.

Mr. LIPSCOMB. I thought we understood yesterday, when we asked the question about the formula, that this would be discussed in detail?

Mr. HOLIFIELD. That was my understanding.

Mr. FASCELL. Let me get something cleared up. You said you anticipated this would be done by interrogation.

Mr. GALLAGHER. That is correct.

Mr. FASCELL. Whom should we interrogate?

Mr. GALLAGHER. Mr. Sanders has the material right with him.

Mr. HOLIFIELD. Mr. Sanders was given an opportunity to speak, and did speak, and he spoke on shelter research objectives of test programs. The only place I saw anything about costs was down here in Dr. White's cost effectiveness studies. Perhaps I read that wrong.

I thought we were going to get to something in the nature of cost of shelters when we got to Dr. White.

Mr. ROBACK. Dr. White, your institute has made a review of all the available cost data and made some estimates based upon those?

Mr. WHITE. No, sir, I would not say we have made a review of all estimate cost data. Our work in cost was mainly to fill in a few areas that were not available, easily, for the national—for a nationwide shelter program.

Mr. FASCELL. Give me a quick example of what kind of factor you filled in.

Mr. WHITE. Excavation costs across the country, for instance. We are a little queezy about using one figure for nationwide excavation. We have some of the elements of costs in some specific shelters. These have been more in-puts for FCDA, upon whom, incidentally, we have relied for our cost information for most of our tests.

Mr. HOLIFIELD. How would you suggest we go about finding some information that would be specifically of value to this committee in regard to the costs of shelters, of the different types of shelters, and relate that cost to the amount of protection which the different types of shelters would give?

Mr. FASCELL. I would see a picture of a shelter and then ask how much it would cost per person.

Mr. GALLAGHER. Actually, the pattern that developed yesterday was that way, Mr. Chairman, and we expected it to develop that way today.

Mr. HOLIFIELD. That was on 1955 shelters and you had charts showing the cost of the shelters based on that.

Mr. GALLAGHER. In the AEC testimony they had projections to national totals on the basis of some unit costs; yes.

Mr. HOLIFIELD. And I assumed you would have something along that line today.

Mr. GALLAGHER. I am sorry, we weren't responsive to what you expected, but in view of the developments yesterday we expected it to come out in discussion.

Mr. LIPSCOMB. It is a question of knowing whom to ask. We didn't know whom to ask.

Mr. FASCELL. If the man has it right here, let's get it.

Mr. HOLIFIELD. He will have to catch his plane. Let's plan on having your staff and my staff get together and build a presentation that will give us some of the information we want and set a date for another hearing.

Mr. GALLAGHER. We will be very happy to do it, sir.

(The material referred to is as follows:)

FEDERAL CIVIL DEFENSE ADMINISTRATION,
Washington, D. C., May 22, 1958.

HON. CHET HOLIFIELD,
Chairman, Military Operations Subcommittee,
Committee on Government Operations,
House of Representatives, Washington, D. C.

DEAR MR. CHAIRMAN: As was indicated in your committee on May 2, 1958, the application of cost experience in the construction of test shelters in Nevada is of extremely limited value. The test objective is generally to obtain engineering design data, and occasionally to proof test a structure which has been designed from data previously obtained. In the first instance, costs are likely to be lower than would be encountered in shelter construction because of economies realized in building only the minimum structure required to yield the desired data. In the second instance, the structural costs are likely to be considerably higher than normal since the building of a complete structure in a remote part of the desert under difficult working conditions calls for greater expenditures than would otherwise be involved. Other complications are involved in the accounting procedures and in the necessary payment for overtime, Sunday and holiday work, as dictated by the requirements of the total test program.

We do, however, find the experience useful in estimating costs indirectly. By arriving at acceptable designs, we determine material requirements which can be costed under normal construction contracts in various areas of the country.

The following cost experience in Nevada, shown opposite the projected average cost of fully equipped shelters of the same type (but of possibly different capacity) built by contract in our cities, will illustrate the difficulty:

Type of shelter	Nevada cost	City contract cost (completely equipped and stocked)
Underground family blast shelter (a) (30+p. s. 1).....	\$11,000	\$3,150 (4 to 6 persons).
Underground garage blast shelter (b) (35+p. s. 1).....	182,000	\$167,000 (500 persons).
Dome blast shelter (c) (30 p. s. 1).....	27,000	\$392,000 (2,000 persons).

(a) The underground family blast shelter tested in Nevada in 1957 was not fully equipped and stocked for occupancy. It withstood a blast overpressure more than double that for which it was designed. If possible, this shelter will be retested in the Pacific under long-duration loading by megaton weapons.

(b) The underground garage blast shelter tested in Nevada in 1957 were not equipped and stocked for occupancy, nor was there mechanical equipment installed to operate the blast door.

(c) The dome structure tested in Nevada in 1957 was a test structure 50 feet in diameter. It did not have shelter entrance doors, nor was it equipped and

stocked for occupancy. The estimate under "city contract cost" is for a 110-foot diameter dome shelter with 3 interior stories, with blast-resistant entranceways, and completely equipped and stocked to protect 2,000 people.

Recognizing that it would be impractical to apply the same design in all areas of the country, we have found it necessary to develop unit cost factors derived from the materials and labor requirements in Nevada, but corrected for factors which would be governing in other areas. The enclosed tables show the unit cost estimates we have developed. They take into account many different types of shelter. Certain distinctions are made based on the aiming areas concept, which was discussed at the May 2, hearing.

Cost of land for shelter would vary with land value and the relative availability of publicly owned land. Structure costs increase with increased resistance to blast pressure. Structure costs also increase as the capacity of the individual shelter decreases. In considering this factor we assumed that the capacity of shelters in the aiming areas might average about 1,500 persons. By contrast, in the B, C, D rings, and other areas, one-half the shelters might average 500 persons in capacity, while the other half would be family size. The above factors account for the variation in unit estimates included in the following tabulation.

Sincerely,

GERALD R. GALLAGHER,
*Assistant Administrator,
Research and Development.*

Shelter costs

[Dollars per person]

AIMING AREA

Shelter type and design	Land cost	Structure cost	Equipment cost	Supply cost	Total
Fallout.....	0	36	29	19	84
Founds per square inch:					
10.....	28	88	33	31	180
20.....	31	108	33	31	203
30.....	31	128	33	31	223
50.....	33	158	33	31	255
100.....	33	202	33	31	299

A RING

Fallout.....	0	37	29	19	85
Founds per square inch:					
10.....	11	99	32	30	172
20.....	11	119	32	30	192
30.....	11	144	32	30	217
50.....	19	180	32	30	261
100.....	19	231	32	30	312

B, C, AND D RINGS AND ALL OTHER AREAS OF UNITED STATES

Fallout.....	0	73	28	18	119
Founds per square inch:					
10.....	2	133	27	26	188
20.....	2	215	27	26	270
30.....	2	302	27	26	357
50.....	2	369	27	26	424
100.....	2	473	27	26	528

Mr. HOLFELD. We will adjourn in order to allow you folks to catch a plane.

(Whereupon, at 4:40 p. m., the subcommittee adjourned to reconvene at 10 a. m., Monday, May 5, 1958.)

CIVIL DEFENSE

Part I—Atomic Shelter Tests

MONDAY, MAY 5, 1958

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met in room 1501-B, New House Office Building, pursuant to adjournment, at 10 a. m., Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield (presiding) and Lipscomb.

Also present: Herbert Roback, staff administrator; Carey Brewer, senior defense specialist; and Robert McElroy, investigator.

Mr. HOLIFIELD. The subcommittee will be in order. This morning we are honored to have before us Dr. Ellis A. Johnson.

Dr. Johnson, I am not going to try to give for the record your background and qualifications, because they are so numerous that I wouldn't know where to stop. But I wish that you would give for the record, before you start your testimony, some of the pertinent points in your background and what you have been doing over the last few years, particularly for the Government; the type of work that you have been doing and service that you have been rendering to the Government in the studies and surveys that you have been making, such that you can reveal for the unclassified record.

Would you like to do that at this time?

Dr. JOHNSON. Thank you, Mr. Chairman.

STATEMENT OF DR. ELLIS A. JOHNSON, DIRECTOR, OPERATIONS RESEARCH OFFICE, JOHNS HOPKINS UNIVERSITY

I speak for myself in this testimony. I was brought up on a farm, I have a doctor of science degree from MIT. I have written approximately 140 scientific technical papers during my scientific career. I was on the staff at MIT for about 4 years. Then I was a staff member of the Carnegie Institution of Washington, under Vannevar Bush, until just a few years ago, when I resigned from a leave of absence.

At the beginning of World War II, I joined the Naval Ordnance Laboratory, and was in charge of the research part of their work, first as a civilian and then as an officer. I served as a naval officer in the Pacific from the beginning of the war until October 1945.

I returned to the Carnegie Institution of Washington after the war to do basic research in geophysics and physics. In January 1948 I was asked by the Air Force to become the first Technical Director of

the Air Force Office of Atomic Energy, AFOAT-1, to establish the system to monitor the Soviet atomic tests and the Soviet atomic stockpile. After that was successfully done, I joined the Operations Research Office of the Johns Hopkins University.

So far as the content of my professional work that affects my testimony is concerned, I have a reasonably good background in electronics. I was at Pearl Harbor during the Japanese attack on December 7, 1941, so I saw what an air attack will do to an unprotected community and installation. I was at Guadalcanal when the Jap raids there began to encounter such a high attrition from our growing defenses, and as our defense increased still further they abandoned their air raids. I was in the first Philippine sea battle, when almost all of the aircraft in that massive Japanese raid were shot down without doing any military damage to the United States fleet that amounted to anything.

Later, as the director of mining in the 21st Bomber Command, I was on General LeMay's staff. I planned two wing missions and wrote the operations orders for a bomb group until the war ended. Thus, I had practical experience in the offensive use of aircraft.

Incidentally, I also planned numerous aircraft operations from the carriers.

I did the analysis for the 21st Bomber Command which indicated that the B-29 attrition rate could be reduced from the intolerably high level of 10 or 12 percent to about 1 percent, by changing the attack plan to independent flights at night at 5,000-foot altitude. The plan was adopted, and as predicted the United States B-29 losses dropped below 1 percent.

In 1948, as the technical director of AFOAT-1, I had access to all of the information bearing on the Soviet capabilities in nuclear weapons and in delivery systems at that time, and I have kept up to date with the information on Soviet attack capabilities.

I have directed and personally participated in and supervised the recent study of ORO on air defense of the United States for the Army.

Mr. HOLFELD. Would you explain what ORO was and how you conducted this study and the general area of coverage?

Dr. JOHNSON. ORO is the symbol for "Operations Research Office." This is an organization of Johns Hopkins University, which operates under contract with the Department of the Army. Its function is to study the ways that can be managed or devised to improve Army operations of the future. Scientific methods are used to develop better information in order to supplement the intuition and the skill of the officers in the military art. This method of supplementing the military skills is especially effective in problems of extreme complication, which are very hard to figure out on a straightforward intuitive basis. It is a method I used successfully in practice during World War II.

So far as air attack and air defense is concerned, we started to study United States defense as a first priority in 1948, and we have continued ever since. It was clear to me at that time that the outcome of the air war, and the ability of the United States to prevent a defeat in the air war, was a necessary condition for our survival. A successful defense is not necessarily a sufficient condition; but you do have to start out with the premise that we will survive an air attack on us, otherwise there are no solutions left for us.

Therefore, we have, until recently, conducted our studies in air defense, responsive to Soviet air attack, on a high-priority basis. This has meant that up to as many as 100 or 120 technical people at a time, and quite a few military people, have worked in ORO in an attempt to understand this very complex problem. Since the amount of civil defense affects the amount of active defense to be provided by the Army, we have tried to understand and incorporate into our overall study the more intensive studies of others on civil defense.

Mr. HOLIFIELD. Included in this complex problem, of course, was the evaluation of the capability of the enemy to attack our Nation with nuclear weapons, and the possible casualties we would incur, and also protective methods to prevent those casualties from being so great?

Dr. JOHNSON. That is correct.

Mr. HOLIFIELD. This whole field that you covered, then, would be a field that would be of direct scientific value and pertinence to the problem of passive defense of every kind?

Dr. JOHNSON. Very much so.

Mr. HOLIFIELD. As well as the military defense?

Dr. JOHNSON. To my mind, they are inseparable.

Mr. HOLIFIELD. To a certain extent they are, in my mind. But when I spoke of passive I meant things that populations can do other than with military weapons to save themselves. When I spoke of military, I was thinking of our offensive and defensive active military forces. I was using the common lay language.

Our subcommittee, in its report, took the position that the so-called civil defense was an integral part of the national defense, and therefore inseparable, so we are certainly in hearty agreement with you on that point.

Dr. JOHNSON. Mr. Chairman, I am glad to hear you make that statement, since my studies of your work and the exceptionally thorough hearings of your committee have led me to respect your judgment.

Mr. HOLIFIELD. We did divide it as to types of endeavor and types of missions.

Dr. JOHNSON. I agree with what I guess you are implying, that the problems of civil defense are problems that cannot be readily handled within the Military Establishment. They involve the essence of protecting the lives of our people and the ways in which that has to be done are dependent very much upon the local civilian actions, as well as upon the centralized planning and the providing of funds from Washington.

Mr. HOLIFIELD. I thank you for that sketch of your background, experience, and your activities in this field.

Now, you may proceed in the way that you care to proceed and introduce such members of your associates as you may wish to at this time, and the record will be clear as to who you have with you.

Dr. JOHNSON. This is Dr. Loewer, who is a consultant for ORO. He has a special skill in the entire problem of construction which has a bearing on civil defense. He did previously work on the staff at ORO, so he has a good familiarity with the overall problem too.

Next, I have Dr. Pettee, who is the assistant director of ORO and who has been just as active as I have in the overall guidance and work on our air defense studies, especially in those things that involve intangibles, and there are many of them in this situation.

Both of them have served the Congress on staffs of committees, so they are familiar with the procedures here.

Next, Mrs. Milton, who is my personal research assistant, and Mr. James Henry, who is the head, the present head, of our air defense studies, and who has been the primary technical man from the beginning of our studies in 1948. He also had a great deal of practical military experience in air defense during the war, with the British Navy in this case.

Mr. HOLIFIELD. Thank you. Now, you may proceed.

Dr. JOHNSON. Mr. Chairman, as a preliminary to my remarks, may I say that it has been my privilege in the course of my work to study carefully the hearings and proceedings of your committee. Although my testimony will probably depict a situation not at all to my liking, I must say that the work of your committee, and especially of its chairman, has brought a great deal of light into an otherwise dark picture. Because I do hold these opinions, I welcome this opportunity to appear before you in the hope that I may make some contribution to your already extensive efforts. I hope that I am wrong, but on the basis of observations it seems that you are one of a very few Members of Congress who have put these national problems in their proper perspective.

I feel I should say, before I begin the more detailed parts of my testimony, that although I do not know if or when the Soviet Union would attack the United States in unprovoked delivery of thermonuclear weapons, that I do know they will have the capacity to do so.

I agree with the conclusions of Malik of Lebanon, in his fine speech to the United Nations in 1949, that if the Soviets have a capability, then if the need arises they will surely use it. The Soviet leaders continue to this day to assure us that this is still so.

So when you have an enemy showing as much hostility toward us and building up his delivery capabilities at an increasing tempo right now, then it is time for us to worry.

Even though we may not know whether such an attack will ever come, we should not provide a temptation, by having a weak defense, which would make such an attack too easy. Our situation with relatively little defense is a very serious one because the Soviet Union is putting about a quarter of its military budget into the air defense, including an increasing amount of passive measures, and all you have to do is to imagine a situation in which they have the attack capabilities—they do have a very strong defense—and in which they strike the first blow, cutting down our SAC to size, as much as they can, destroying enough of our population and our industries so that we will not have a will to fight for several years, and then consider whether that does not give them a unilateral capability of taking other actions in the free world which we would be helpless to counter, because we would fear the consequences of their thermonuclear threat.

They will probably reach their full capability in the era 1961 to 1963, if they continue the present trends. Of course, we must bear in mind that, they too can change these trends. They do have economic problems.

Now, the time left to us is very short and we must realize that all of our defensive action, and that includes civil defense in a very important way, takes time: Even if you appropriated the moneys

now it would be a year before you would really be ready to roll in construction. Necessary steps would include the centralized planning, the detailed planning, the acquisition of land and materials, and it might be 2 years before you could really have enough construction to be significant enough to really help to deter a Soviet attack.

Thus, because of the timing, right now delay in civil defense endangers more people every year, perhaps as many as 5 or 10 million people who, if we delay additional years, will not have the possibility of being saved, and that is an important responsibility for the Congress.

The other problem, which I think has been made clear in your hearings of 1956, is that we need an understanding and leadership in civil defense, which I say must come from Congress because you can't build shelter everywhere. A universal program is a \$100 billion program, which is out of the question.

So that you have to study the value to the Soviet Union of attacks in different areas; you have to, from that, determine where the most shelter, for example, can be provided, and that cannot be decided on a local basis. It must be decided on the basis of central planning in Washington.

However, after that is done, you cannot get the real cost and learn the real difficulties without making local plans.

I feel that this is going to require great funds from Washington, which brings the problem back here, and after funds are provided you have to go back to local execution of the detailed plans.

I would argue that civil defense measures, certain ones, are a very critical part of the United States defense. The civil defense measures have to include a lot of physical things and a lot of human things.

Among these are, of course, a shelter system and its associated warning system. The warning system is primarily military, but it has great significance to the civilian defense operations. So there is an interaction there. Furthermore the training of the civil population, the training to get the shelter refugees out of the shelters in many areas, and the restoring of an adequate food system is going to be quite difficult, if the attack is massive.

There are then, three elements of national defense against a thermonuclear attack, first of all civil defense, which is primarily designed to take care of the population. Its emphasis is to save lives and people, not to save industry or the military system itself. However, what is done in civil defense does depend on the active defense.

Second, we cannot preserve our homes and industry except by active defense. We have got to keep the bombs from actually falling. That means you have to then consider how much money to put into active defense; this includes surface-to-air missiles, interceptors, antisubmarine defense, and anti-ICBM defense.

Third, since no defensive United States system opposed to attack by the Soviet Union can be successful unless it involves the threat of active retaliatory United States military action, our main deterrent is going to continue to be our strategic attack forces, SAC and naval air currently; in the future IRBM's and submarine-launched missiles as well. I assume our national objective is to deter the Soviet Union from an attack because it will not be profitable; that is,

that they will believe that their attack will fail and our retaliation will succeed.

We need to preserve all elements in our community which make it successful, especially our population, and that is endangered by some kinds of attack which active defense cannot protect, and which civil defense can protect.

We have to protect industry and the bulk of the population, and active defense is the only kind of a system that will insure that.

We have to, overall, preserve our will to fight, which means that we must keep our casualties in people and in industry below a certain point. The point of the maximum damage we can stand is difficult to choose. I think we are a tough and courageous people, and could survive quite a lot of damage and recover to win the war. But certainly there is some high level of damage to us at which our own will to fight would end. We must prevent such a high level of damage.

Then we must consider the same elements in the Soviet system, and we have to recognize that we have an unsymmetrical situation where they will attack first, and that they have many choices of attack. Because they have many choices in attack plans, they can force us toward complete protection of all of the critical elements of our society; that is, the people, the industries, and our military installations.

That, of course, makes it more expensive for us than if we knew ahead of time their exact plan. If they plan to put all of their attack effort in destroying SAC to prevent retaliation that means that the number of civilians threatened and killed would be small. If they planned to put all of their effort into attack on the population and the industry, and to neglect SAC, hoping to blunt SAC's attack by their own excellent defense against air attack, then very many United States civilians would be killed.

It is the uncertainty in our guess as to the Soviet attack plan that produces such a wide variation by different authorities and experts in the estimates of how many United States civilians will be threatened or killed in a Soviet attack. The estimate depends on the assumed nature of the Soviet attack plan.

It is because the Soviet Union has a number of alternatives they can choose, and if we are weak in the protection of any one of these elements—people, industry, or Military Establishment—then they will search out our weak spots.

Now, I want to identify the place of civil defense.

First, I do not think it competes with active defense. In fact, it supports the other two elements and there is no substitution for it, and the reasons are commonsense ones. We cannot deter the Soviet Union on a defensive basis alone. We have got to have a retaliatory force, otherwise they will not be hurt. Hence, strategic attack forces are the most important element of deterrence. We want to protect as much of our industry and people as we can by an active defense, but we know it is not possible to make an absolutely airtight defense. Some bombs are going to get through.

If an attack actually occurs, and if our active defense is weak, the Soviet Union knows it can settle the issue just by the bombs that fall, with or without passive measures.

But we cannot provide an attack-proof umbrella over the entire United States. That means, then, that there are some attack alternatives open to the Soviet Union which avoid the active defenses, and use fallout as a primary means of attack, and these attacks have the capability of killing, depending on the plan you assign to the Soviet Union, anywhere from ten to fifty million people, without the active defenses coming into really important play.

I do not mean that there will not be many an attacker shot down, because there will, but this will not prevent the large destruction of people as compared to large destruction of industries and cities.

An estimate of 50 million fallout casualties assumes we have no system of fallout shelters, that our population is not indoctrinated and trained, and that we are essentially caught by surprise so far as civil defense is concerned.

Furthermore, we have a problem of timing in meeting the Soviet attack systems. As we know, it takes us about twice as long as the Soviet Union to develop new weapons or weapons systems or defense weapons systems, and this is a very serious problem for us because it is quite in contrast to our short development time and great achievements during World War II.

This disadvantage means that we cannot be sure that we will meet the timing of the Soviet attack systems. If they come up with some new form of attack, we are going to have an answer to it perhaps 5 or 10 years later, and although our intelligence gives us say a 3- to 5-year ability to estimate what they will have, still we will always tend to be behind them until we correct our present dangerous situation with respect to the speed of military development.

Civil defense has this extremely important characteristic: It is a long-term investment useful against any type of Soviet thermo-nuclear delivery system by just in saving millions of United States lives. Again, I do want to stress that we need a combination of active defense, of a strong SAC, and civil defense.

If we do not preserve our homes and industry and food supplies, it would be a cruel thing indeed to save the population for several weeks, only to have them die of exposure and starvation, which is a real possibility if you lose most of your homes and city structures and industry and your food system.

Well then, we need to provide funds for all of this, and there is the nub of the problem. You require a balance in expenditures—for strategic attack, active defense, and civil defense—and we need to get the most for the defense dollar, and this is the essence of the dilemma.

It is not only the air war that is at stake and that requires funds; it is the funds for preventing or countering limited war, the funds needed to strengthen the economy of the world, the free world, the funds needed to strengthen and provide balance of our own economy, which is uppermost in our minds now.

So there are many claimants for the United States funds, and each claimant is overly anxious to do the best job in the thing that is assigned to him.

Therefore, the emphasis in my testimony will be to establish the minimum requirements for civil defense, rather than the maximum ones or even the best ones, because it is a problem, in the end, of money.

How much can we afford?

I will consider two situations; a reasonable position of adequate military strength, and a situation of thermonuclear disarmament, because that also is a possibility uppermost in our minds.

Now, I went over the hearings of this committee of 1956 in which you had many distinguished scientists, engineers, and executives, and it seems to me this testimony forms a good basis for consideration, even today, in the Congress. The testimony and estimates were in reasonable agreement in most details, although there was a considerable range in the estimates of cost of shelters and the total funds required, and I will summarize that with some new data.

The situation has now changed in a few respects. We know more about the balance between offense and defense; we know something more about the timing of a Soviet attack capability. We have pinned it down from a vague 1960 to 1970 to a narrower time frame.

We know the possible characteristics of the Soviet missile systems from our own work. Physics is the same the world over, so that limits what can be done.

We know more about our own detection and warning capabilities, and all of this clarifies the need for civil defense.

Now, I do not wish to consider in my testimony the problem of defense of the strategic attack forces, but rather only the people of the country, because I consider the other a military problem to be treated separately.

I will cover the passive measures connected with the defense of the population, their homes and other supporting structures.

I would like to summarize the situation; to put it in context. The 170 metropolitan areas contain about 50 percent of the United States population and 70 percent of the manufacturing and supporting services. That is concentrated in a rather small part of the land. It is a primary target. It is primary because if the Soviet attempts to attack many small cities, they would just run out of attack vehicles and bombs, at least in the near future.

However, we are so concentrated that 30 to 50 accurately placed hydrogen bombs can destroy 30 percent or more of our population and our industry if left undefended.

I am going to come back to this so I would like it remembered, because—and this also states the essence of the active defense problem—our defense must be far, far better than any air defense of the past.

It is important for us to remember that our first 14 cities are about equal to their first 140 cities. That means that it takes about 10 times as many bombs on the Soviet targets as it does on the United States targets, to accomplish the same job, in proportion.

Mr. HOLFELD. That is in population and industrial capacity, I suppose?

Dr. JOHNSON. Yes. It is primarily in population, from the recent release of the Soviet census on their cities—and we have to make the assumption that their industry is correlated with their population in cities; that is true in the United States and the rest of the world and it is reasonable to think it would be true in the Soviet Union too, because industry is where you have people running the machines.

Of the enemy attack systems, the most accurate and cheapest is the manned bomber. It is now available to the Soviet Union. They also have the bombs. United States active defense against this is economically feasible, in my opinion, economically feasible from both an economics and military point of view.

Mr. ROBACK. What is the state of the technical art? Does it require expensive new work and bringing up to date our defense warning systems?

Dr. JOHNSON. Yes; it does involve a continuing and important technical struggle connected with target acquisition. That is because the key problem in a very high defense is to acquire the targets and to control your fire so that you can really kill every one of the attacking bombers.

Mr. ROBACK. Are those capabilities implicit in the weapons now either available or to come into production?

Dr. JOHNSON. Yes. There is, furthermore, an increasingly intensive program of R. and D. in electronic countermeasures and counter-electronic countermeasures.

Again our effort in counter-electronic countermeasures has been minor compared to our effort in ECM. We have emphasized our own SAC attack capabilities and put too little effort into defense which implies counter ECM. In fact, our counter ECM fund is about one-tenth or one-twentieth of the ECM funds. So at the present time there is some question as to where we are with respect to the Soviet Union ECM versus our counter ECM.

However, there is no question in my mind but that the advantage is on the ground defense, because you can just put so many tons of equipment, so much power and so many acres of antenna on the ground compared to the precious space and weight if it is airborne, and you can use an active-passive system. I am sure that the end of this struggle, which is not a tremendously expensive one compared to the missiles themselves, will eventually end in a complete defeat for the manned bomber.

But I am not going to say that this is the state right now. The technologists are always fighting to destroy defense and offense capabilities, and we will have no easy situation where anyone can say to the Congress this problem is settled forever.

All you can say is, if we use due diligence, the odds are very much in favor of the defense and of counter ECM, which is what I am saying.

Mr. ROBACK. Will the manned bomber run out before the technology of countermeasures catches up with it?

Dr. JOHNSON. Well, that is a problem in the balance of offense versus defense. No one in their right mind would go to ICBM's or ballistic missiles in general if they were going to be completely unopposed so far as manned bombers are concerned.

They are far more accurate, and I think will remain so, although many disagree with that, and they are also by far the cheapest.

Mr. HOLIFIELD. The manned bomber?

Dr. JOHNSON. The manned bomber.

On the other hand, if we develop a very strong defense against manned bombers, then, of course, the cheapest course of action, in fact, the necessary one for the Soviet Union, as for ourselves, will be to

introduce new systems for which a defense has not yet been perfected or is in being.

It seems to me again that is commonsense.

Thus the struggle is always a military-economic one. First you have a good attack system; then it is countered by a good defense system, and to the disadvantage of the attack, and then you use R. & D. to find a new attack system which either the defense cannot counter or develop easily, or one in which the economics are against the defense.

In other words, if we can find an offensive weapon which is very cheap compared to any defense, then we have got it made. We can then spend all of our defense funds on the very strong and very cheap offense which, of course, will win against the very strong, but too expensive defense.

Mr. HOLIFIELD. Without regard to the technology, at this time in the world we find the advantage strongly on the offense and the disadvantage on the defense in all nations. Is not this liable to continue? I look at our own effort. Say, for instance, in the missile field there is no doubt in my mind we are spending a great deal more dollars on the offensive missile than we are in trying to develop the antimissile missile.

Dr. JOHNSON. Yes.

Mr. HOLIFIELD. In other words, this is always the trend?

Dr. JOHNSON. I do not believe this trend must or will continue. The offense has no particular or clear advantage from a technical point of view. The advantage of the offense is that it is used with initiative and if you are the attacker it permits you to decide the place, time, and nature of the battle. The aggressor can also plan for the war he desires—the defender cannot, thus the defense must be able to counter any aggressor plan or weapon. The aggressor has the advantage of a lead in development while the defense sometimes does not act until intelligence is available on enemy offensive weapons. This lag is not necessary since defensive development can proceed on the basis of a possible need and then be produced or not as needed. This saves lead time. Because of their short lead time in development the Soviet Union now has an advantage over the United States in both offense and defense. However, since we do not plan a preventive war against the U. S. S. R., defense is essential and critical to us. How much we need depends on the technological-military-economic exchange rate. Let me put this in reasonably simple economic terms. A defense cannot be designed which is 100 percent proof against thermonuclear attacks, for example, so that no bomb falls on the United States. But let's suppose you have a situation where we have a very weak defense, then you only need 50 bombers to do the job.

Supposing we develop a strong defense which can knock down 90 percent of the attacking aircraft, then they have got to have 500 bombers to do that same attack job.

Now, we shot down 90 percent of the attacking aircraft in the first Philippine Sea battle. It was done once, and with good modern technology that can be done again. And the result of a strong modern defense is that it will drive the U. S. S. R. up to its economic limit where it just cannot produce enough high-cost modern attack systems to really be sure that its attack on the United States will be effective.

The U. S. S. R. would have to build more and more attack systems at high cost to counter our moderate cost defense systems. So although the defensive system will not insure absolute protection, it does insure that the attacker will not be able to have enough of an attack system to keep from being uncertain as to the outcome of his attack.

He will not know whether he will win or not. The defender will not know whether he will win or not either, but without defense you make a very cheap offense possible, well within the enemy's economic limit.

If we build enough defense, and provided the economics are in the right direction (and they are) we place him in the situation where he is going to wonder forever, "If I lose the attack will I survive or not? Will I really defeat them or not?"

You bring an uncertainty into the military outcome, and that is what we want to achieve, because we are not the kind of country to loose thermonuclear holocaust on the world. The Soviets must never be sure they can initiate a war and win.

So that the problem of defense is not the simple one of just saving lives by itself. We have to forget that kind of a simple approach and think of it in terms of military economics. Economics of the two cultures.

Mr. ROBACK. Is not the biggest factor in increasing the enemy cost at the present time and maybe for some time in the future, the diversification of attack points to bases in a dispersed geography?

Dr. JOHNSON. Could you say that again, please?

Mr. ROBACK. Is not the biggest cost factor, as far as the enemy is concerned, the potential of retaliation from diversified bases? In other words, you can increase his cost by increasing your defense system; you can increase his cost by having a potential comeback from many different places because he could not take them all.

I mean relatively in which way is this consideration more important? Is it more important to enhance your defense system, or say, to keep bases dispersed?

Dr. Johnson. That is a difficult question to answer. We are looking for the most economic relation between offense and defense as you suggest. That includes dispersion of the SAC bases, and their hardening. SAC can do a terrific job in hardening SAC bases against ICBM's, but if we compare the various combinations of offense versus defense cost to us against the Soviet attack system, and the question of what would happen to them if we attack we have to bear in mind that they are spending a quarter of their military budget on defense against air attack. They have got a movie indoctrinating their whole population on civil defense. It shows all the American bombers being shot down and then finally almost the last one gets through, and they go from there to say, "Now, what do you do?" And you get a pamphlet that tells you what to do on civil defense that you can read while you are milking the cow.

I do not know much about their shelter system yet, but we do have to appreciate the fact that against our retaliatory strike, there will be very strong air defenses on the Soviet side.

In fact, the probability is very high that those defenses will be far better than ours if present trends continue.

All right; if they have a strong air defense, and the Soviets have shown that they want it by putting so much money into it, then al-

though we may have saved SAC by itself, that does not insure that the outcome is the best one, taking everything into account, especially if we have lost our will to fight. If we put our money and effort into protecting SAC, which I would also do as a high priority and if that is all we do, we may lose our population, our cities, and our will to fight. It is not enough to save SAC—we must simultaneously save our country.

I personally do not care if we have destroyed the Soviet Union, if we ourselves are dead and destroyed as a nation. We have got to do both, do we not? We have got to deter them because they will be destroyed, but we have also got to be sure that our population and our cities survive because our will to fight is based on that, and the whole mission of the Military Establishment is not revenge and retaliation; it is to preserve the United States and its way of life.

Thus I feel that we have to think not in terms of our military problem alone, but our complicated problem of what is it the United States wants to do in the world.

Mr. ROBACK. I was not only talking about hardening bases, but about dispersal around the world.

Now, suppose the factor came up as to a withdrawal of bases from certain areas? Since dispersal of bases round the world is a cost factor for the enemy because he has to consider all the possibilities, the point of my questioning was, weighing the decrease in cost that a disengagement would have for the enemy as against the increase in cost which you might seek through an improved defense or defensive system, do you get the point of my comment?

Dr. JOHNSON. Yes, I do.

Mr. ROBACK. Does it make sense to say we should increase the cost to the enemy by increasing our defense capability when on the other hand we say we might let the cost to the enemy be decreased by a withdrawal of bases?

Dr. JOHNSON. Well, that is again a complicated and controversial problem in which I wish I was better qualified to speak. I cannot help but worry, from talking to my many friends in NATO countries, and other data, about the security of our bases. Wherever we put in bases, you have subversion in the local area by the Communists, and it seems to me that our bases become less and less secure, and less to be counted upon.

Furthermore, I agree that it is desirable to have the maximum number of effective bases, because that will impose the need for additional Soviet attack capabilities. Unfortunately, the Russians already have and will continue to have very simple and cheap attack capabilities against all of our IRBM bases and overseas bases. They have a very large number of medium- and short-range bombers, and can install counter IRBM bases in the satellites and Russia. It will be cheap for them to destroy overseas bases compared to destroying SAC bases in the United States. I believe the economics favor United States defense by a very large margin.

If I were running the Soviet campaign, I would not worry about the overseas bases very much. I would have to run a complicated and extremely difficult air operation, which I am capable of doing, and I believe that I could take the United States, if it had only a purely offensive system composed of United States and overseas bases, because I would have the advantage and initiative of surprise.

How I would do this, I prefer not to say except in a closed session. I wonder if I could complete my prepared statement.

Mr. HOLIFIELD. Go ahead. You are summarizing a great deal of your prepared statement here as you go along?

Dr. JOHNSON. Yes, I am.

Mr. HOLIFIELD. That is all right. You go ahead.

Dr. JOHNSON. Well, the U. S. S. R. will have the ICBM's in 1961. The bombs will probably be smaller than for aircraft and, very importantly, the expected delivery error, to begin with, will be large, perhaps 6 or more miles, that is to say perhaps 10 times as poor as for bombers. Therefore, many more ICBM's will be required to do the same job from the attack point of view.

On the other hand, the advantage of the ICBM is that no defense is as yet perfected, although the consensus is that it can be done, but perhaps not in time to meet the beginning of the major Soviet ICBM threat.

There are two critical changes introduced by the ICBM's, in addition to the lack of defense. The low accuracy means that the ground zero is not accurate. These ICBM bombs will fall within a 20- to 30-mile circle, at least at first, which means you cannot propose a particular ground zero and prepare shelters around it in the "fringe" areas.

Any part is just as likely to be hit as any other part, and the warning time, 2 to 4 hours for bombers, is down to 8 to 20 minutes for ICBM's, and 3 to 10 for submarine-launched missiles. That means a very short warning time.

Now, the present estimate for the United States situation is—and I agree with these estimates—that from 20 million to 90 million American deaths might occur if we are attacked now. The deaths would be due primarily to direct blast and thermal effects, assuming we have no effective shelters against blast or thermal effects. Casualties could be reduced to 10 million to 30 million, with 30 p. s. i. shelters. So if we can get people into blast shelters, it would be good.

With homes and industry destroyed, and with fallout to cope with people would have to stay in shelters against the fallout for up to 2 weeks, depending on the particular area. Attacks designed solely to use fallout and to avoid active city defenses could produce as many as 50 million deaths. This is all commonly known.

Now, with respect to the amount of shelter against fallout, there are two things that we have to consider, and that is the indirect effect of fallout as compared to the direct blast and thermal effects, and to recognize, as Dr. Lapp did so well in 1956, that the effect of radiation is reduced with time; greatly so after 2 weeks. Survival up to then indicates a very good chance for continuing survival. Some time can probably be spent outside shelters after the first few days, in many places, on a schedule, provided you know what the radiation is. So you have to have that measured.

The problem of shelter is one of how much material you get between yourself and the fallout. The fallout comes down like snow. Again, Dr. Lapp outlined that in 1956, with respect to his foxhole analysis. But 10 inches of concrete, or its equivalent, reduces radiation to one-tenth; 17 inches to over one-hundredth; 22 inches to over one-thousandth. If you have the right kind of materials and equivalent

weight in earth, wood, stone or metal, you can obtain the equivalent shielding. To estimate the shielding all you have to do is to be where you would be in the shelter, in imagination take away the walls, the roof and the floor, and then look around to see what you would see if it had snowed. And then estimate how much material in equivalent inches of concrete is between you and the snow, on the average, and you get some idea of the shielding factor.

Well, if you do that, inside of an ordinary home, you get a shielding factor of about four. This is on the average. For the center rooms of tall office buildings, hotels, or apartments, you can have a shielding factor as high as a thousand, depending on the construction. And in basements you can get a factor as high as a thousand. In some places and under some conditions of fallout a factor of 5,000 in shielding is needed, for example close to the bomb or where a very high intensity might occur. But it is clear that you can get a tremendous and good protection in many existing structures.

So we need to consider seriously the existing shelter, and we also have to consider the warning time available to the United States population and its effect on the shelter requirements.

Remember, we have 8 to 20 minutes warning of a forthcoming ICBM's impact. We are going to encounter this threat by 1961 to 1963. We can't have any shelter program that amounts to anything much before that time, no matter how much money the Congress appropriates. Therefore, there is no use any longer in thinking of bombers by themselves as the main problem, or of evacuation. We have to consider the worst problem. If we solve the ICBM problem, we have solved the simple problems, too.

Now, there are a set of actions needed before the population can get into the shelters. We have to transmit the warning to the cities, we have to transmit the warning over the local warning system, we have an average reaction time of individuals to take into account. It takes time to evacuate buildings and it takes time to travel and get into shelters, if these are community shelters.

I have given the timetable on page 11 of my prepared statement. It takes 4 to 8 minutes to warn communities, 1 to 2 minutes to get out the community warning, 1 to 5 minutes for the reaction time of individuals, 5 to 8 minutes to evacuate a 6-story building, and very much more for a taller building; 2 to 3 minutes to travel two or three hundred yards, and you wouldn't put shelters much closer than that. That amounts to 13 to 26 minutes. We have 8 to 20 minutes to work in. That means that although, under the most favorable circumstances, we might get a lot of people into the blastproof shelters, it is just going to be nip and tuck with most of them, and I think that we are not going to have the perfect actions that we would like to have.

Thus, I feel that the case for blast shelters is marginal, not because they won't do the job mechanically, but because we won't be able to get a big fraction of the population into them in time.

Mr. ROBACK. That assumes all the missiles will simultaneously drop?

Dr. JOHNSON. Yes, that is right. And there is a problem there, except that you can certainly schedule it so that the total warning time is 20 minutes for most of the main targets. No more than 20 minutes

for most of the main targets. The U. S. S. R. is going to have to schedule their missile attack carefully too. I agree, it is not a simple problem.

But, again, that is a problem of the skill of the attacking planners in order to make the attack a coordinated one. That has always been the problem in air attack. The attacker's problem is how to saturate the defenses.

Now, in some of the important cities we have a lot of buildings above six stories, and that means increased time, which would make the situation even less favorable. For example, in Washington, there are some 50,000 people who live or work, by actual count of the buildings above six-stories high and who would have a relatively small chance of getting out.

In New York City there are 1½ million people who live above six stories, about 10 percent of the population. And in the 25 largest metropolitan areas about 2 million live above the sixth floor.

Now, it turns out that in those heavily populated areas, that is also the place where it costs the most to make shelters, that is, in the very densely builtup areas and the costs of digging out facilities, digging down deep, and to get enough area, is a very difficult one. I believe that in those special cases like New York there is a really serious question as to whether or not you could get very much of the population into the blast shelters, in any event.

In New York, if there is any chance of a sub-launched missile, it would be even worse, 3 to 10 minutes warning is all that would be available.

Mr. HOLIFIELD. On that point, there certainly is, or will be very soon, the hazard of submarine-launched missiles?

Dr. JOHNSON. Yes.

Mr. HOLIFIELD. And the fact that the Soviets have specialized, as far as their naval craft is concerned, in the production of submarines, is indicative of their thinking along the lines of attack, as well as of defense, in a naval way?

Dr. JOHNSON. They may have this capability now, so far as we know.

Mr. HOLIFIELD. That is right.

Dr. JOHNSON. Well, this, of course, makes the situation for the sea-coast cities, those within a reasonable range of the sea, say 100-200 miles, especially difficult with respect to time to get into the blast shelters. Thus, I conclude that community shelters are of dubious value as a major defense investment, so far as blast is concerned. I would rather see the same money put into active defense.

However, there may be some cities that are the farthest away from the Soviet ICBM sites, the farthest away from the seacoast, which might still profitably use blast shelters. I would then summarize the blast situation, saying that I conclude that we cannot rely on shelters for primary protection. That is, for direct effects, the funds required for dubious protection against blast and thermal effects are not warranted; that such funds would be better spent on a balance between additional attack capability plus more active defense, to keep the bombs from actually falling.

The case of fallout is absolutely different. We have an additional 20 minutes, at least, after the bomb falls, before we have to get into

shelters. Of course, it may be difficult because of a disorganized situation. Downwind we have additional time, up to several hours, before fallout occurs.

Now, we remember, however, that it is possible to kill 50 million people just by fallout, if they had no fallout shelters and were not indoctrinated. If they are indoctrinated, the losses will be cut down, and appreciably so, without any shelter program.

This danger area downwind reaches 1 to 200 miles downwind with serious danger to everyone in the area. Since a perfect active defense is impossible, after the bombs fall, the only protection is the shielding factor of a fallout shelter. Such shelters can save an additional 10 million to 50 million lives; and that, it seems to me, is a situation where the strategic retaliatory forces and the active defenses do not compete in civil defense. Civil defense against fallout performs a function that is not performed by anything else. And there are particular Soviet attack gambits which could emphasize a fallout attack, avoiding the active defenses, destroying a minor number of homes and industry, but killing such a big fraction of our people that we would have left no will to fight.

Against that form of attack we must have fallout shelters. We simply must have fallout shelters. Otherwise, this is the gambit that may be chosen by the Soviet Union. They could direct the major percentage of their attack forces to destroy our SAC and other strategic attack forces, and assign a relatively few of their bombers to fallout attack, avoiding our active defenses. They could then kill up to 50 million Americans. They might then have reduced SAC to an ineffective force. If they then had very good thermonuclear defense of the U. S. S. R. they would survive our attack and win the war because with 50 million dead our will to fight would be gone. We would not survive in the sense of remaining a United States of America.

I can see no way of countering this kind of fallout tactic unless we have a good fallout defense composed of a system of fallout shelters and an indoctrinated population.

We need next to compare the high cost of a hypothetical defense of the entire United States based primarily on active defenses against the cost of a combination of active defense for the principal city targets plus fallout shelters for the primary population target which would be vulnerable to fallout attack.

Now, as a result of such comparisons, I conclude that it is essential to provide fallout protection as a part of an overall deterrent structure. And this is a part of deterrence as well as of survival.

Mr. HOLIFIELD. Why do you say that?

Dr. JOHNSON. Well, going back to my last illustration, if I were on the Soviet side, if I could use my tremendous capability in attack to destroy United States military establishments to cut down or eliminate the retaliation on the Soviet Union, and if I could destroy the American will to fight simultaneously with a relatively small fallout attack, which is all that would be required, I would certainly consider that as a pretty favorable course of action for the Soviets and it could be executed with minimum risk to them.

If, on the other hand, the whole American industry and population structure remained and I had not attacked it, but I had put all the effort in attacking our SAC and our other strategic attack forces,

then I would certainly worry about the surviving Americans and what they might do when they are aroused in a unified war effort.

We have a history of rising to a challenge which is tremendous, and any country that really stirs us up has got something to worry about forever after, until we have settled the issue one way or the other. It takes a lot to get us into action, but I am proud of Americans, from having seen them fight over a number of years, and I think the Russians and the rest of the world—Russians in particular—would worry about that. It would be a risky course of action for them if they can't kill our will to fight, as well as preventing an attack on themselves.

After all, their target is not primarily our strategic attack forces, it is to take or subvert the rest of the world. We are the block that stands in their way. The part of that block that is important is the American population and industry. They must know that we are never going to attack them with our military attack forces. That is not the danger to them. The danger is the American population and industry, if it survives their attack.

Therefore, if we can insure that there is at least a good chance for survival, of our population and our industry then, it seems to me, that this tremendously adds to deterrence. If the Soviet Union does not destroy our population and will to fight it increases the risk to them and greatly reduces their chance of winning the war.

I would like to turn now to the range of costs for blast and fallout shelters, and the cost of multipurpose construction. In the blast situation, as you know, at about 30 pounds per square inch, the pressure increases very rapidly toward the bomb point of impact, and also, at the same time, the cost of higher protection against blast increases. So it is of marginal value to increase blast shelters very much above 30 pounds per square inch. Although the choice is arbitrary, shelters designed to withstand 30 pounds per square inch tend to get the most for your money.

For that kind of a shelter, cost estimates range from \$10 to \$150 per square foot. That is a pretty big range. It amounts to from \$100 to \$1,500 per person.

Now, there are some reasonable reasons for this variation in cost estimates. The variations depend on the cost of the land; construction costs vary by a factor of 2 or 3, depending on the soil conditions, and so forth. In very big shelters you have a lower per-capita cost than in small ones. On the average, I would estimate that it would cost about \$400 a person to provide 30 pounds per square inch blast shelters.

This, of course, would have to be determined more accurately on the basis of the more local and detailed plans, if we are to employ blast shelters. Four hundred dollars is good enough for estimating purposes.

Mr. HOLIFIELD. We have testimony that would run it quite a bit less than that, locally.

Dr. JOHNSON. I know you have. Our own analyses tend to be somewhat pessimistic. You mean locally?

Mr. HOLIFIELD. I mean in local conditions. Your costs run very close to the Nevada costs, which have been testified to be about $2\frac{1}{2}$ times the amount of average cost throughout the United States, and

with certain possibilities of even decreasing those costs by mass production and by the utilization of some types of shelter, such as your quonset-hut type, placed underground, with 3 to 5 feet of earth over it.

Mr. LIPSCOMB. Mr. Chairman—

Dr. JOHNSON. Is this a blast or a fallout?

Mr. HOLIFIELD. This is fallout. And fallout plus a certain amount of blast.

Dr. JOHNSON. Could I anticipate you and say that on the same basis I would estimate the cost of fallout to be between \$100 and \$300 per person. My own feeling, from having reviewed all this, is that this might average \$200 per person. So the fallout is one-half the cost of the blast.

Mr. HOLIFIELD. Mr. Lipscomb.

Mr. LIPSCOMB. I point out that his costs include land and construction.

Dr. JOHNSON. Yes, I have included land.

Mr. LIPSCOMB. The other one just included construction.

Dr. JOHNSON. Yes. Actually, construction costs are not the major costs. You have to have land, ventilation, food, and electric power. These really cost more money than the actual construction cost itself, which might range in the order of 20 or 30 percent of the total cost. So perhaps our figures are consistent.

You will be interested in the table, which is on page 17, in which I made a survey of the various structures designed and built for other use which might be suitable either for blast or for fall out protection. These are tunnels, subways, underground roads, underground storage, underground garages, and so forth. A good example of a dual-purpose structure is the Swedish blast garages. The structures of table II have all been built. The costs were crudely adjusted to 1957 costs, and you note that they range from about \$400 per person, for the bigger type of structures, to the order of \$100 to \$250 per person for underground garages, and that the Swedish blast garages costs fall within that range of costs.

Now, these are not speculations of costs of designs that haven't been built. These structures have been built. And you can't help but be struck by the fact that these costs are within the range of the estimates of what it would cost to build special-purpose structures.

On that basis I find it difficult to argue for any other course of action than: If we are to adapt and build blast structures, they should definitely be multipurpose. It would be much more economic, and there is no question you could use the structure for both normal and shelter use, with some reasonable modification.

Mr. ROBACK. Is the wide difference in price between the Swedish blast shelters and garage due to the size, accommodation, and capacity?

Dr. JOHNSON. I couldn't tell. I obtained my data from three sources, from the article in Life, the article in American City, but I relied principally on the data from the Counselor of the Swedish Embassy. These Swedish structures are certainly superblast structures, because they have about 80 feet of granite over them. The data gave the number of people that could be sheltered at 9 square feet per person. That compares reasonably with United States designs.

Mr. ROBACK. This committee has inspected some of those Swedish shelters. It has been pointed out by some people that the terrain

conditions in Sweden permit direct tunneling without a great deal of excavation.

Dr. JOHNSON. Right. But I point out that the estimates and the costs in our own underground garages are right in that range, too, and these have also been built. I have got the list of them all over the country. If we have built them, we can build more of them. So, I say, the cost will be in this range, just on the basis of our own practical experience.

Mr. HOLIFIELD. You have that running from \$100 to \$250 per person?

Dr. JOHNSON. Right. Again, the cost of construction of underground garages depends a lot on the soil conditions. If you have, as the Swedes do, solid rock to deal with, shelters are lower in construction cost. In contrast there are some places in the United States where it is exceedingly difficult to put in a deep underground structure.

There is also a surprising agreement on costs in the United States, in spite of the variables of land cost and construction conditions. Perhaps some of that is because underground garages, that are built, must meet competition, and businessmen have selected the conditions where you could compete.

It is my opinion from having discussed this in detail with Dr. Loewer, who can plan and build these kind of structures, that the costs of table II are reasonable costs. They have been and can be achieved in commercial structures, of the types that have been built in the past and will continue to be built.

Mr. HOLIFIELD. Of course, I think the element of cost has been the reason why we have never faced up to the problem of thermonuclear and other types of nuclear war.

When we start talking about a program of \$15 to \$20 billion to save the population, 75 to 80 percent of the population of America, it immediately becomes in the minds of a great many people a prohibitive amount. Of course, they fail to relate it to the objective of saving 50 to 75 million people, and they also fail to compare it with the annual cost of military armament for offense and defense. They tend to look upon it as a luxury item, sitting off by itself, and with no relation to the objective of national survival.

Dr. JOHNSON. Right. If you want to act in an actuarial way, you can estimate than an American life, just in the gross national product he contributes, on the average, is about \$200,000, or at least between \$100,000 and \$200,000. On that basis, the value of the lives saved by fallout shelters would be great in comparison to the cost. The lives would be worth \$10,000 billion; the cost about \$10 billion; the paidup premium rate 0.1 percent. That is low-cost insurance. It is trivial insurance premium. And we do insure our lives, and the premiums we pay are far higher than this premium.

Mr. HOLIFIELD. Oh, yes.

Mr. ROBACK. Do you think a multipurpose shelter would have a psychological value in conditioning the public to this type of a program; that is to say, if you build underground garages it wouldn't have the sinister aspects of burrowing in the ground?

Dr. JOHNSON. I do, because I myself, dislike the neutral and passive "dig or die" philosophy, because it does have an unfavorable connota-

tion to Americans. We do believe in direct action in solving our problems. Still, we know that there are some people who have built tornado shelters in the West, and it didn't seem to be cowardly, at that time. In the United States we live a physically secure life, and we forget that at times of extreme physical danger passive measures are necessary. Just the same I personally argue most strongly that we must take a strong, positive, and a creatively progressive attitude with respect to world problems. I hope we will all agree that we do not obtain solutions to world conflicts by defense alone, or by digging shelters alone. In contrast; it would be folly to ignore the companion need for civil defense. I am driven by logic and the facts to believe that in this case we have to build the fallout shelters.

But if we do build shelters, certainly, as you suggest, we should make it appear as little "dig or die" as it is possible for us to do so.

Mr. HOLIFIELD. I think your comments in regard to the American psychology is probably true. But your American psychological approach to the problems of offense and defense stem from the traditional modes of warfare, such as when the men stood and fought at Concord and Lexington. That concept of warfare no longer obtains. I understand some of those soldiers did not refuse to get behind a tree to protect themselves from their enemies. We need a different kind of a tree now. You can't get behind a tree to be protected from radioactive fallout: you must get under something.

Dr. JOHNSON. Right. Mr. Holifield, I was on the 1010 docks at Pearl Harbor and watched the *Utah* capsized. I watched the sailors jump into the burning oil. Shots were coming all around me. I shook my fist at the skies and at the Japs. But, you know, in the last big Japanese raid I was in, I was the first man in the foxhole. I learned the hard way that you lived and survived by some defense as well as being on the attack. And the two go hand-in-hand. It really is naive to think that you must always attack and never defend and you are a coward if you do defend. Each have their appropriate balance and place.

I learned it the hard way. Believe me, no one was ashamed of being the first in the foxhole. They felt pretty good about it. [Laughter.]

They stayed alive to fight.

Mr. HOLIFIELD. Well, of course, as you say, this type of psychology came to you gradually as a result of the stern pressure of events. The American people, not having been exposed to the stern pressure of radioactive events which can occur, are, of course, psychologically naive in this new field of nuclear warfare, and they have no background of experience to teach them, and certainly, personal experience at the time of a nuclear attack will not teach them. There would be no one left to profit from the lesson. You escape an artillery bombardment and learn it is a good thing to get into a shelter. In that type of a war you don't have an opportunity, if you are subjected to high intensity radiation, to learn your lesson, and in the next attack get under shelter.

This has to be assimilated as a result of education and leadership, and a recognition of scientific facts not yet experienced.

Dr. JOHNSON. Yes. I think you have hit on the thing that has disturbed me, the whole effect of atomic weapons is to compress the

whole time scale. But unfortunately, man is awfully hard to change in his attitudes, so that it is hard for us to adjust to this instantaneous type of danger. But atomic weapons, wherever you see them applied, they compress the time scale, so you have got to do everything quickly and decisively, and it is very different from the wars of the past.

Perhaps I could continue?

Mr. HOLIFIELD. Proceed.

Dr. JOHNSON. The serious dilemma is really the question of fallout versus blast shelters, with fallout shelters costing about half, and with the fallout shelters of a nature so that you can terrifically supplement them in many areas by basement shelters, or even by staying in the houses, or in tall buildings that survive. And I would argue, wherever buildings survive, you have a good chance of people surviving. That was the Nagasaki and Hiroshima experience. But even in the case of fallout shelters we should consider the lower cost multipurpose structures, underground garages and storage warehouses, and so forth, which because they are multipurpose, could cut the cost well below those I am going to estimate.

I would like to call the attention of the committee to the fact that there is a plan for the construction of underground subways and roads in Washington that is estimated to cost about \$3 billion in the next decade or so. Such underground structures would be excellent for fallout shelters with appropriate modifications. The civil defense and such programs should be mutually supporting and might well be partly supported by Federal funds.

I am unable to make an overall plan, obviously, but I say that I believe that the costs that I am going to estimate here would be such that they might also be cut, after you worked out the detailed plan. So although there should be plans for a considerable increase in appropriations, these overall plans should be reviewed every year to see what comes out of the more practical and detailed plans.

We have all the information we need, all the facts we need, and we are ready to do the detailed planning, if you can get a policy decision in fallout versus blast shelter.

Mr. HOLIFIELD. Our testimony last week from structural engineers and from doctors and scientists was to the effect that we now have enough information to go ahead and do this job; not that there won't be other information accumulated as time goes on, but that we do have enough information to do the job now, if the policy is made to do it.

Dr. JOHNSON. Yes. I believe that 170 metropolitan areas should have a very strong active defense, but should not have any blast shelters, because I don't think people can reach them. And if there is money available, the funds that might be put in pure blast shelters should be spent on active defense.

In multipurpose structures, which I favor, you might still get structures that are both blast and fallout. All the better. If you can get any percentage of the population into a blastproof structure in time, that is fine. We are going to have to look in detail to specific planning for each city to find this out.

There is going to be a delay in time before we can have an adequate shelter system. This is critical, because if you appropriate the funds in this session it would be 2 years before the shelter program is fully

underway, just because you must have as a preliminary central planning, local and detailed planning, land acquisition, and preparation for construction. But the time is very short before the U. S. S. R. reaches its full capabilities. That means that it is just marginal now as to whether we will meet the timing of the Soviet attack capability.

On the other hand, regardless of that, we ought to go ahead. These shelters will be single, long-time investments which will be good even if the situation changes with respect to the active and other defenses. I think we ought to try to save as many American lives as possible, even if we lost the cities, themselves. Our basic resource is the American people—not buildings, land, or SAC. I feel that fallout shelters, again, are absolutely necessary to a good defense against thermonuclear attack; that there is no substitution possible for them, but that a big fraction of the shelter need should be provided in the multistory buildings that survive, and basements, perhaps modified.

But we will need additional fallout shelters in some areas, either where there aren't enough big buildings or enough basements, or where you expect radiation intensity that will be greater than you can get in these other structures.

However, with good indoctrination, we could help quite a lot even now before new shelters are built. Our population is not yet well indoctrinated in civil defense.

I would estimate that we would have to spend something in the range of \$10 billion to \$15 billion, overall, for fallout shelter system, in the most probable target areas.

Now, this does not include shelters for every person in the United States. We are going to have to take some considered risks. Perhaps we might average this out to something like a total cost of \$12 billion. The exact amount we will have to find out as we get into the detailed plans. We cannot do it in too much haste, because haste here will mean waste.

If we just start building shelters at random we may overbuild in one place and underbuild in another. You can save a tremendous amount of money by having detailed plans and going at the whole business in an orderly way. Although that seems to go against the real need for haste, it is the usual difficult compromise that one has to make, it seems to me. Perhaps with forceful leadership and the full support of Congress and the Executive, it may be possible to speed this up and avoid part of this 2-year delay. I believe we can have a full scale program underway by 1961, and perhaps accomplish a very considerable fraction of the required shelter program.

Now, in table 3 on page 21, I have given my estimate of what appropriations might be appropriate for fiscal year 1959 to 1961. These estimates are based upon the need for orderly planning, the cost for plans in detail, and so forth, and an acceleration with time as we get into actual full-scale construction across the country. I feel that there needs to be an annual review of the problem, but the first year appropriations can provide detailed plans and experimental construction, and then you can consider the possibility of accelerating the shelter program from then on.

I believe that because of the size of the construction industry, that you would probably need to limit the maximum yearly expenditure to the range of \$2 to \$4 billion per year. Perhaps you could do more than that, but it would be difficult.

I have reviewed civil defense in some detail, but I firmly believe that the 1956 hearings of this committee form the basic document and data for a sensible civil-defense program. I have been reviewing that program with my own additions to bring the facts up to date. I would call the attention of the committee to the talk by Nils Montan, Counselor of the Swedish Embassy, and the Life and American City articles on the Swedish experience, which is practical and down to earth. I don't know whether the committee thought well of their structure or not.

Mr. ROBACK. They were certainly impressed. I wouldn't want to speak for them.

Dr. JOHNSON. Now, the study made in ORO for the Department of the Army, on the balance between the active, passive, and civil defense, is available to the committee, I understand. The ORO studies on civil defense are less thorough than I would have liked but this was because civil defense is not a primary Army responsibility. The ORO work was a review and integration of the work of others, primarily in FCDA, and was used to understand the balance between active and civil defense. I have expressed my unqualified views in an interview with the U. S. News and World Report on this whole question of balance, and I didn't think it would be appropriate to repeat that here.

Mr. ROBACK. Are you in a position to say whether that report you mentioned for the Army studied the shelter problem?

Dr. JOHNSON. It did study the shelter problem, in order to relate its importance with respect to active defense.

Mr. ROBACK. What is the status of the report? Has it been finished and submitted?

Dr. JOHNSON. Yes, it was submitted in August of last year, and is now being officially distributed. It has been officially distributed by the Army, and it has been briefed to about 2,500 people, including the staffs of the Army, Navy and Air Force (to Admiral Burke, for example), and to many other groups in Research and Development of the Air Force, Lincoln Laboratories, et cetera.

The report, itself, has had very favorable comment from the Army. The Air Force did not agree with certain parts. General LeMay wrote to me to emphasize that. We had our most serious criticisms from technical people; people from Research and Development, for example, Rand, and OEG. Much of this criticism was based on the differences in assumptions, and they were honest differences of opinion. The report, I think, is generally agreed on by all as presenting the methods we ought to use to get an understanding of this complex balance in defense, even though there is some disagreement, in fact appreciable disagreement, in details.

Mr. ROBACK. Did the Gaither committee have access to the report?

Dr. JOHNSON. Yes, they did. They had access to everything in the Government so far as I know, and they had a number of copies of the ORO report and used them, I believe intensively. And they had one of the principal people, Dr. Vincent McRae who had worked on this report at ORO, as a full-time member of the Gaither committee.

Mr. ROBACK. What about the Rockefeller committee; they didn't necessarily have access to classified documents?

Dr. JOHNSON. The Rockefeller committee didn't have access to classified documents. I was a member of the committee. I didn't

have too much luck in interesting them in active defense. They were tremendously interested in civil defense, and we heard evidence from many people on that, including Mr. Moses, city planner for New York, who seems to be violently opposed to passive defense.

But I believe that the people on the Rockefeller committee covered a wide range of experience and included people who had had access to almost everything that is known in the Government and included staff from the Gaither committee. And even though all of the discussions were unclassified, and the classified knowledge of each individual was packed in a sealed compartment in each brain, the previous access of each individual could not help but guide the unclassified conclusions and recommendations.

Mr. HOLIFIELD. The recommendations.

Dr. JOHNSON. Yes. I did not agree with a good part of the Rockefeller report.

Mr. HOLIFIELD. I read Mr. Moses' article in some magazine.

Dr. JOHNSON. Harpers.

Mr. HOLIFIELD. Harpers, I guess it was. And I think anyone with a wide background of knowledge can take his article and tear it to pieces on certain assumptions that he made and certain arguments that you put forward, as being unrealistic, in facing the problems of nuclear war, and also in being rather of a fatalistic nature, "it wouldn't do any good to try to prevent the loss of life anyway."

Dr. JOHNSON. I do think we have to think of this problem in terms of three simultaneous actions and, their interactions, costs, and the function of each. The Congress must judge amongst the claimants for the great funds needed for each of these actions. First, it is very important to strengthen very greatly the active defenses against bombers, missiles and submarines. The submarine problem is one that needs a great deal of attention.

Second it is equally important to provide fallout shelters and the associate provisions for warning and rescue, and control of the entire possible thermonuclear disaster.

Third, we must strengthen our complex of strategic attack forces—SAC, ICBM's, IRBM's, submarines. Now I have not covered all of the interactions and problems of balance that are concerned with the basic decision. I am very familiar and concerned with all these intricate details, that must be considered to make our defense work. It will not be an easy job.

Mr. ROBACK. Can we interrupt you there? You have referred to all these complementary elements of a defense system. You have referred to the appropriations possibilities. You have referred to leadership, but you have an unstated premise that there is an organization in the Federal Government that is prepared to discharge these functions.

Now, have you studied or do you have any views with regard to the appropriate kind of Federal organization to carry out the program within the time limits and within the components of your program to accomplish all these things?

The reason I ask that question is that the President has made a decision, at least a tentative decision, as to the kind of nonmilitary defense organization there should be. He has submitted a reorganization plan to the Congress which would merge in the Executive Office of the President all the functions of the Federal Civil Defense Adminis-

trator, and all the functions of the ODM Director, with the apparent intent of reallocating these functions to various Federal agencies.

Now, the question then is: Can these functions be performed by many Federal agencies better, or by one Federal agency better, or by several?

Dr. JOHNSON. I have been in Washington, except when I was away in World War II and Korea, since 1934. I know all the dangers of too big a bureaucracy. But also, I have seen in the practical actions we have to take, the fact that a central agency has the best capability of understanding the whole problem. I do believe a civil defense agency should have complete access to all the war plans involving defense. In fact, it should have access to the war plans involving our retaliatory attack on the Soviet Union.

I believe that to disperse responsibility for civil defense would just add so much to the delay in action that it would be very unfavorable.

I do not believe that the Washington system of multiagency cooperation has much of a record of success. I believe that it would be too difficult to achieve successful civil defense by a coordination of agencies each with piecemeal authority.

I will admit that you will need, very importantly, to use other agencies than a central civil defense agency, but there should be one central and very strong group that can be responsible for the central planning, the defense of the funds, and a leader that you can fire if he does not do a good job. Otherwise I am afraid effectual accomplishment will be endangered because responsibility will fall between the cracks.

Mr. HOLIFIELD. Well, in our evaluation of the previous record of delegations by the FCDA and the ODM, we found that in each instance where functions were delegated they were more or less grafted onto an agency as an appendage, and certainly as a very minor part of their major mission. Therefore they tended to be lost, as you say, between the cracks.

One of the most glaring examples of that was that through a combination of ODM and FCDA delegations the subject of urban vulnerability was transferred or delegated and redelegated to the Housing and Home Finance Agency. Of course, the Housing and Home Finance Agency has as its major mission the promotion and financing of home construction. It, therefore, received this delegation to study the urban vulnerability of our Nation with also a transfer of some \$17,000 to accomplish it. And you can imagine how much importance and attention it had received, in comparison to the major mission of the agency.

So the present theory of delegating to various Government agencies parts of the work which might be thought to be proper for that agency to perform is carried forward in the reorganization plan. The same area of delegation and spreading out the responsibility among many, many agencies of Government obtains, and I, too, fear exactly what you fear, that the decentralization of responsibility and function and the delegation of function and responsibility will end up in zero as far as accomplishment is concerned.

Dr. JOHNSON. I have participated in such delegated activities and it seems to me that we just go round and round, and a system evolves so that anyone who objects is able to take something important but controversial off the overall plan. We usually end up with the program

of lowest common denominator, i. e., the program no one objects to; usually a mediocre program.

I think that this is the nub of the problem, that there is a very big civil defense job to do. It needs a very strong central organization to do it and it cannot develop and do its job unless it has the full support of Congress.

It has to get the full support on an official basis to attract good people and it has got to have enough funds so that it is taken seriously.

I personally feel that just large funds without the strong organization could very well come to naught, or at least I am sure that you would have too great a delay in execution.

Mr. HOLIFIELD. And is it not also your opinion that such an agency must be based on statutory authority and functions which have been made permanent through legislation by the Congress, rather than the temporary and changeable policies that might be wrapped up in Executive orders?

Dr. JOHNSON. Very much so.

I very strongly believe in good organization.

Mr. HOLIFIELD. If a function of an agency is dependent upon Executive orders, it will not have, in my opinion, the support of Congress in a major way from the standpoint of appropriations.

Dr. JOHNSON. Yes. We see the favorable effect of organizations set up in a statutory way, for example, the National Advisory Committee for Aeronautics—some of these statutory organizations have done wonderful jobs. Ad hoc organizations and arrangements, I believe, are all right during a war; but, for the prolonged period we are considering, you need the long and continuing know-how of a skilled professional staff associated with central organization, and you cannot get that unless it has the prestige and status. That is especially true among scientists these days.

Mr. HOLIFIELD. This is one of the reasons why members of this committee advocated legislation which would define functions and place the responsibility in a central agency, and set it up by statute, and also place it on the level of prestige and dignity of a Cabinet department.

You would not subscribe to the idea that the functions of civil defense should be placed in the Department of Defense?

Dr. JOHNSON. No, sir, I would not.

Mr. HOLIFIELD. You would have—

Dr. JOHNSON. I feel very strongly opposed to that.

Mr. HOLIFIELD. You feel if it is going to be successful it would have to be a separate mission and directed by civilians?

Dr. JOHNSON. Yes, with the reservation that this civilian organization does need to have access to the military facts of life.

Mr. HOLIFIELD. Yes; that is true. In order to evaluate its mission and prepare for it.

Dr. JOHNSON. Yes. I have just a few closing comments.

Mr. HOLIFIELD. Very well.

Dr. JOHNSON. I believe bearing the costs of a civil defense program is essential to the United States. I think the critical question is whether the President, the Congress, and the people think the burden necessary and possible. I do.

Finally, the question is whether the possibility of disarmament may obviate civil defense.

First, I think we must proceed with civil defense until actual disarmament is actually assured, and must bear the annual cost until then.

Second, it is absolutely certain that the Soviet could surreptitiously set aside the 50 or more bombs required to decimate an unprotected United States and could deliver them by converted aircraft. There is no inspection system that would guard against that. There is no possible inspection system. Such an illegal attack after disarmament would require a Soviet conspiracy involving only a few people; the Communists are quite capable of such a conspiracy. If, then, all of our defenses are gone, if we are both disarmed to zero as many people seem to desire, that still does not mean that we might not suddenly have appear in our skies over our cities, unscheduled aircraft capable of killing 20 to 90 million people. If that happened to us, as a result of Soviet conspiracy, then they could easily rebuild unopposed their armament and could then take over the world, whether we liked it or not. Unless we can completely trust the Soviet Union, disarmament might be fatal to the free world unless great safeguards are established.

Therefore, defense at least against manned aircraft and civil defense are required indefinitely, or until long after the Soviet Union ceases hostility and attempts to subvert the free world. I see no escape from that conclusion. We have no reason to believe at present that either with or without world disarmament the Soviet Union can be trusted.

On the basis of the Soviet record, we cannot afford to neglect our defense.

I hope that I have been able to substantiate my opinion that civil defense is an integral part of deterrents, a continuing part of the need to make ineffective the possibility of an unprovoked thermonuclear attack on the United States, either with or without disarmament, and, as an integrated and important factor in United States defense, it is a civilian function and should be established on a statutory basis as an independent agency of the Government.

Mr. HOLIFIELD. We appreciate your summarization and the remarks which you have made which are outside of your prepared testimony.

Any questions, Mr. Lipscomb?

Mr. LIPSCOMB. No, sir.

Mr. HOLIFIELD. Any questions from the staff?

Mr. ROBACK. Dr. Johnson, can you tell us a little bit more about the function of the Operations Research Office at Johns Hopkins? Is this an agency that is exclusively devoted to Government contract work?

Dr. JOHNSON. Yes. It has been up to this time. Its work has been primarily but not only for the Army. At Army request we have done work which involved the whole Department of Defense, the Atomic Energy Commission, and the State Department. Essentially we have a straightforward and simple contract with the Department of the Army.

Mr. ROBACK. Is that a continuing contract or a renewable one?

Dr. JOHNSON. The budgets are provided on a 3-year basis so far as expenditures are concerned, but from a practical point of view it is on a 1-year basis. That is to say, the funds appropriated can be spent over a 3-year period. They are almost all expended in 1 year, but because of subcontracting, consultant arrangements, rent, and accu-

mulated leave, we do need to have the 3-year authorization for expenditure.

Mr. ROBACK. Does Rand Corp. occupy an analogous position with the Air Force that you do with the Army?

Dr. JOHNSON. Yes, it does. They are about twice our size though and have been in existence about 2 years longer than we have.

Mr. ROBACK. What kind of studies has Rand made in this field? Have they made general defense studies, do you know?

Dr. JOHNSON. Yes, they have. They are an exceptionally competent organization. We work in general with very good cooperation with them.

In the case of the recent ORO report, or our air defense report, they have some strong differences of opinion with us. It is interesting that there are also many people inside of Rand who have strong differences of opinion with the people in Rand who do not feel that our report is one that they could agree to.

I, however, hope you will talk directly to Rand about this because they are an excellent group. They do studies that in methods are very similar to ours except that they concern themselves with Air Force action. Many of their studies have been of somewhat broader scope than ours.

In 1953 they did a topnotch study of air defense emphasizing Air Force actions. When it was our turn last year because of the deep Army interest in air defense, we emphasized Army operations. For either one of us to study air defense continuously would strain our resources so that we could not be able to do the other very important work we have to do for the Army and Air Force.

The Rand opinions on this very problem would be very important.

I have the fullest confidence in their abilities. However, let me say this: I have heard arguments in the Department of Defense that you ought to have only one scientific outfit because scientists do not agree with each other.

Of course they do not. They are looking for new ways to go and use new information. In the beginning of new studies nobody can be absolutely sure of the early facts. We search out the truth by use of the classical methods of science—rankless Aristotelian arguments.

If you look at the Physical Review for 1900 to 1910, you find that about 95 percent of the papers did not live; they were exploratory and some went up blind alleys. But we got where we are now by the scientific method which includes controversy in the Aristotelian sense; that is, argument.

Thus I cannot honestly represent Rand's capability. You should ask them. I do say that I have a high respect for them.

Mr. HOLIFIELD. Thank you, sir.

(See exhibit B of the appendix for a statement subsequently submitted by the RAND Corporation.)

Dr. JOHNSON. I want to say once again, Mr. Chairman, that I think the time for action on this problem is now. I am scared by this 1961-63 capability of the Soviet Union, and if the Congress waits 1 more year—we have waited too long already—but if we wait 1 more year, that next year we can never buy back.

Mr. HOLIFIELD. That is certainly a sober note of warning, Dr. Johnson.

The Chair agrees with you. We have waited too long already to face up to some of these problems. We can only push forward with the capability that we have and with the state of mind which the Congress has in some of these problem areas. We appreciate very much your testimony.

Would any of your associates like to say anything at this time?

Dr. PETTEE. No, sir, thank you. I think Dr. Johnson very well represented us.

Mr. HOLIFIELD. Fine. We appreciate all of you being here this morning. We appreciate your testimony, Dr. Johnson. Thank you very much.

The meeting is adjourned.

(Whereupon, at 12 noon, the subcommittee was adjourned.)

CIVIL DEFENSE

Part I—Atomic Shelter Tests

THURSDAY, MAY 8, 1958

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met in room 1501-B, New House Office Building, pursuant to adjournment, at 10:05 a. m., Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield (presiding), Fascell, and Lipscomb.

Also present: Herbert Roback, staff administrator; Carey Brewer, senior defense specialist; and Robert McElroy, investigator.

Mr. HOLIFIELD. The subcommittee will be in order.

We are pleased to have the Department of Defense witnesses before us this morning. The Chair will recognize Mr. Hugo Facci. Is that the correct pronunciation?

Mr. FACCI. That is right; yes, sir.

Mr. HOLIFIELD. From the Office of Director of Construction, Office of the Secretary of Defense (Properties and Installations).

Mr. Facci, we will ask you to proceed in the manner in which you plan to have your witnesses appear and introduce them for the record at this time.

STATEMENT OF HUGO FACCI, OFFICE OF DIRECTOR OF CONSTRUCTION, OFFICE OF SECRETARY OF DEFENSE (PROPERTIES AND INSTALLATIONS); ACCOMPANIED BY ALLEN FORE, OFFICE OF DIRECTOR OF CONSTRUCTION, OFFICE OF SECRETARY OF DEFENSE (PROPERTIES AND INSTALLATIONS); COL. J. E. McHUGH, OFFICE OF EMERGENCY PLANNING, OFFICE OF SECRETARY OF DEFENSE (MANPOWER AND PERSONNEL); CAPT. DAVID LAMBERT, DEPARTMENT OF THE NAVY; LT. COL. ELLIS E. PICKERING, DEPARTMENT OF THE ARMY; CAPT. FERD E. ANDERSON, JR., DEPARTMENT OF THE ARMY; MAJ. ROY C. WEIDLER, DEPARTMENT OF THE AIR FORCE; AND LT. COL. SVEN BACH, DEPARTMENT OF THE ARMY, MEMBERS OF THE ARMED FORCES SPECIAL WEAPONS PROJECT

Mr. FACCI. Thank you, sir. Our general plan this morning would be this, Mr. Chairman: I will speak for OSD. We will not call on any other witnesses from the Secretary of Defense's office unless we

get into areas in which the committee has particular questions. Then we will be followed by the Army, then the Navy, then the Air Force representatives.

Mr. HOLIFIELD. All right; you may proceed.

Mr. FACCI. I have a statement here that will give a general picture, we trust, of the entire DOD approach, philosophy, and programs in protective construction without going into too much detail.

The protective construction policy was stated by the Joint Chiefs of Staff in 1952 and extensively revised and restated in 1955. It was implemented by a series of Department of Defense directives and instructions in 1955 and 1956, and the military departments have, in turn, disseminated the policy by memorandums, instructions, and planning operational documents.

The policy on protection of personnel is simply to provide protection comparable to that which is established for the population of the country as a whole as a national policy.

For protection of operational missions, including equipment and personnel, the policy consists of the following elements:

Protective construction may utilize or consist of shelter—structural strengthening—dispersal, alert, duplication or camouflage, or combinations thereof, to produce the most effective essential protection against an anticipated attack.

This protection must be justified on the basis of an operations analysis; the level of protection must be supported by a target analysis. The operations analysis will establish the equipment and personnel which are really essential to carrying out the mission during a specific period of time.

The target analysis determines the “survival probability” for the mission on the basis of the size of weapon, error of delivery and the level of protection. For any assumed attack, the “survival probability” increases with the level of protection. This latter may vary from high overpressure values to fallout protection only.

The priority by which protective construction projects are approved and carried out depends upon the strategic importance of the operational mission which is protected. The highest priority items, obviously, are the elements of the retaliatory force, with comparable or lower priority on command centers, vital communications, active defense aircraft and missiles, and so forth.

That is the summary statement on the existing policy, and I would like to take just a few minutes to go into the philosophy of protective construction as we see it in the Department of Defense.

Protective construction is primarily an operational requirement. It is part and parcel of the equipment and personnel with which it is associated in the same way that armor is part of a tank. It must fit the operational requirements of the equipment and personnel. In other words, it is an integral part of a weapon system. Its function is to assure that the weapon can carry out its mission, not to preserve it for posterity.

Thus, “shelter” alone will not necessarily provide the best or optimum protection. An aircraft, after attack, may not be able to operate out of a cave or an underground shelter, or its crew may not survive in the existing radiation environment once it gets out. Therefore alert or dispersal, neither of which involves shelter, or both, may be the solution in this case.

Briefly, the best method or methods of protective construction are determined first of all by the characteristics of the weapon system being protected. Furthermore, for any one weapon, the type of anticipated attack and the available active defense and warning time will determine the necessary protection.

Base dispersal and alert status may be best for SAC bombers, which thus can get out of range before the attack actually hits, but they probably are of no value—that is, dispersal and alert—to ICBM's which cannot be moved readily, and alert obviously means nothing for such items as atomic weapons storage.

Conversely, the SAC bomber dispersal and alert, which today is quite a practical solution, may lose some value 5 to 10 years from now as more weapons are available to the enemy and as warning times decrease.

Therefore each system and element must be first studied from the operational point of view and then if alternative feasible methods of protection are available, choice must be made on the basis of cost, time effectiveness, et cetera.

All protection will cost more money. The best formula to use in justifying it is how much more operational capability will this buy, or, ideally, how many fewer weapons do we need to buy, if we protect them, to assure the same attack intensity against the enemy.

Once the decision is made regarding the type of protective construction to be used, the level of protection must be established so that each element of the system—and these may be rather farflung and complicated systems—has the same degree of protection and the whole is not appreciably stronger than the weakest element.

A completely sheltered missile may be saved, but will nevertheless be useless if the nearby radar guidance equipment has been damaged or destroyed, and cannot be replaced readily.

On the subject of construction and engineering, I would like to give a little background on the early studies.

In January 1956 the military departments were asked to submit order-of-magnitude estimates of possible future protective construction programs. At that time the SAC dispersal policy and protection of overseas petroleum storage by all military departments were already under active planning.

The reports were not program documents and represented probably the highest potential expenditure for protective construction. These are the highest priority items.

The Army and Navy reports together amounted to about \$750 million for future 5-year period; the Air Force did not cite actual cost estimates but indicated a long list of facilities and missions which might require some type of protective construction.

The actual programs which were subsequently submitted and approved were, naturally enough, much more restricted in magnitude. Most of the difference can be accounted for by the difference between an idealized concept and a real program. But there were several secondary reasons for the greatly reduced scope.

The strategic categories of the facilities were overestimated, that is, were set too high in the 1956 studies.

The programs, when submitted, were not sufficiently well justified.

The cost of protective construction ran into the stone wall of a relatively fixed and limited construction budget. In some cases, where

the more tenuous and indefinite requirement for protective construction competed for funds with urgent and firm requirements for other facilities, the protective construction lost out.

These difficulties are being gradually ironed out as we gain more experience in planning these programs.

The total of the authorized fiscal year 1957 and fiscal year 1958 programs and the as-yet-unauthorized fiscal year 1959 program are given only to illustrate the size of the effort so far undertaken in the Department of Defense. Construction of SAC dispersal bases and alert facilities will total somewhat more than \$500 million.

Virtually none of this consists of shelter for personnel. The rest of the program cost attributable to protective construction for all military departments ZI and overseas—that is, in the continental United States and overseas—amounts to about \$50 million in facilities whose total construction cost is \$300 million.

In other words, out of this \$300 million of facilities which included some element of protective construction, \$50 million of that very roughly is accessible to protective construction.

Unit costs of blast-resistant construction will depend primarily on the level of protection desired, the clear span required, special entrance requirements, and the permissible shape and location of the structure. Each of the military departments has had its own history and experience with costs.

The range of these costs is from the order of \$2 or \$3 per square foot additional for small aboveground structures strengthened to 10 pounds per square inch—by additional, I mean over and above the conventional construction cost—to almost \$200 per square foot for moderate span, below-ground, rectangular structures strengthened to the 100–200 pounds per square inch range.

I may state here that this includes equipment—without getting too much in detail as to this particular type of structure, it includes equipment for moving the operational mission equipment. In other words, there is considerable mechanical and electrical in that cost of \$200 per square foot.

Comparison with conventional costs becomes extremely complicated and almost meaningless for high design over pressures and for below-ground construction because operational functions, space requirements, accessory facilities, et cetera, change entirely.

Dr. Newmark's statement on the "state of the art" of design and construction made to this subcommittee last week, fairly represents the DOD point of view as well. A few additional points are emphasized.

First, variations of 20 percent to 30 percent in actual strength of structures will not be important in most cases. The effect will be a relatively small reduction or increase in survival probability of the facility or mission.

The important factors are that a facility is entirely unprotected or has low, moderate, or high level of protection. This is particularly true for our retaliatory force, whose strongest influence is in deterring an enemy attack. The mere fact that these retaliatory forces are hard to destroy or damage by an enemy surprise attack is of the utmost value in itself.

Returning to the question of design capability, the Army and Navy have their own design and review staffs both in the headquarters and

in the field. The Air Force has a review staff in the headquarters and has been made fully responsible for the design of its SAC missile technical facilities.

These agencies have used the services of virtually all the outstanding engineering firms in the country who have capability in the field of protective construction. Preliminary and final designs for construction projects which are being done currently include fuel storage facilities, missile launching facilities, and communications operations facilities.

In general, we feel that we have now everything that we need to know to build personnel shelters which will resist the weapons effects in the area of 200 pounds per square inch. There are certain military problems requiring protection of sensitive equipment and, possibly protection to higher levels, so that we are continuing our research and will continue some testing if we have the opportunity.

One of the major problems that exist today is to assemble the large amount of outstanding information into such form that it can be readily understood and used by practicing engineers. There are some efforts along this line, but a lot remains to be done.

Mr. HOLIFIELD. I would like to interrupt you here. We have a list which the Air Force has prepared of a large number of studies extending back several years, some as far back as 1951, I notice.

This all has to do with the problems of protection in case of attack, does it not?

Mr. FACCI. Yes, sir.

Mr. HOLIFIELD. I am struck with the number of studies which have been made. Would the Chair be right if he assumed that you have a tremendous amount of information in the field of materials and structures and stresses and strains and all the other problems that would go with the impact of weapons?

Mr. FACCI. Yes, there has been quite a mass of information, Mr. Chairman.

Mr. HOLIFIELD. How much of that has been digested and put together in composite form?

Mr. FACCI. There are a number of publications from the engineering point of view. Probably the best example is the series of manuals put out by the Corps of Engineers on design—structural design manuals, which all include all of this.

Mr. HOLIFIELD. How much of this material has been duplicated by other branches of the service? Have these studies, in other words, been made available to all branches of the service?

Mr. FACCI. Yes. The next part of the presentation will get into research studies. The monitoring agency or the focal point for these studies, both laboratory and field, and the coordinating agency has been the Armed Force Special Weapons Project. They work with the three military departments and with the Secretary of Defense in order to see that the services are aware of what each other are doing.

Mr. HOLIFIELD. Let me ask you another question. Has all of this information been made available over the years or has it been available to the Federal Civil Defense Administration?

Mr. FACCI. Some of the information has been made available to the Federal Civil Defense Agency.

Mr. HOLIFIELD. Could you give me an estimate as to how much? Have you withheld the items here which you have marked secret or restricted? Has that type of information been withheld from them, or just not requested by them?

Mr. FACCI. May I refer this question to one of the backup witnesses for the Secretary of Defense, Col. Ellis E. Pickering of the Armed Forces Special Weapons Project?

Mr. HOLIFIELD. Yes. Colonel Pickering.

Colonel PICKERING. There are certain items which are withheld. However, in our opinion there are no items withheld that bear on the problem that we are discussing today. Colonel McHugh here has a list with him of the things that have been made available over the years to the Federal Civil Defense Administration.

I have not seen that particular list. However, having quite a lot of knowledge of what the Air Force has been doing, I would say that there is nothing on that list that would be withheld from Federal Civil Defense Administration.

In other words, there is probably nothing in that list which would be withheld under the rules we are operating under.

Mr. HOLIFIELD. Then the committee can be right in assuming that there is a great body of information in the engineering and construction field and the material testing field which is and has been available right along to the Federal Civil Defense Administration?

Colonel PICKERING. Yes, sir.

Mr. HOLIFIELD. Would you consider that this is in a form which could be used by them?

Colonel PICKERING. The material is given to them only in report form—in other words, copies of reports of those projects. It requires a quite competent scientific and engineering staff to put these pieces together.

Many of the projects concern small pieces of large problems, and it requires a very competent scientific and engineering staff to put the results together into usable form.

Mr. HOLIFIELD. Your answer then would substantially be this: Assuming they have had the budget and the ability to acquire competent scientists and engineers, this material could be digested and such parts of it as are necessary for the protection of human beings against blast and radioactivity could be deduced from the studies that have been made?

Colonel PICKERING. Yes, sir.

Mr. HOLIFIELD. I think I won't ask any other questions at this time.

Mr. Roback just called to my attention an item in House Report No. 839 of this committee. In July 1957 we had before us the University of California people who had been given a contract for radiological defense planning. Their testimony, as I remember, contained a complaint that they had not been allowed to have full access to Government information.

I was just trying to find the place in the testimony received from the representatives of the FCDA—"The subcommittee learned that the principal problems encountered by the University in obtaining access to essential information stemmed from complicated administrative procedures adopted for the transfer of information from the AEC and the Department of Defense to FCDA," and then it goes

into quite a complicated statement as to the difficulty which they had in receiving data which was classified and obtaining clearances to get this information.

So that was the reason I was prompted to ask this question.

Colonel PICKERING. I might suggest that Colonel McHugh, Office of the Secretary of Defense, has a better answer to that specific question.

Mr. HOLIFIELD. Would you care to respond to that observation?

Colonel McHUGH. Yes, sir, Mr. Chairman. Perhaps that was the case in 1957, but I feel very confident that the condition has been corrected. At that time the University of California project Civil—which is the name given to the University of California contract group—could not be given classified information. There was some question about clearances, and about it being able to take custody of classified material.

Project Civil has had access since to a number of Department of Defense and Atomic Energy Commission publications and installations. I am confident that now they have all the material that they can use. The flow of material from Defense to the FCDA is primarily for the FCDA to feed it to their contractors in the development of projects for which they have contracts.

Mr. ROBACK. Colonel McHugh, how do you handle the documents which have weapons information which you think they do not need to know? That was the big issue, or one of the big issues—a document which had some information you thought they didn't have to know.

Colonel McHUGH. When we went into that, Mr. Roback, I believe it was determined that actually the information Defense and the AEC was feeding them was exactly what they needed. Actually, they were not being held up by the reason of any security clearance for access to classified information.

Mr. ROBACK. Another aspect was that they get clearance for knocking on one door, then they have to get another clearance to knock on the next door. In other words, they couldn't go through the dividing door.

Colonel McHUGH. There are, in the operation of the Atomic Energy Act, certain difficulties which have been imposed on us by the Congress in order to protect atomic weapons information.

We have made, I think, a monumental effort in meeting halfway FCDA and its contractors. They have made a very fine effort similarly in meeting us halfway to overcome some of these difficulties. The flow of information now is constant and adequate.

Mr. HOLIFIELD. We hope it is adequate now. I think one of the troubles we found from the people who were hired to make the study, the University of California people, was that by virtue of classification in many fields they did not know what to ask for. Of course that does present a difficult problem.

Colonel McHUGH. Sir, that is true. When I say the FCDA and its contractors meet us halfway, I mean that they now define what it is they are looking for, rather than asking for specific reports. They are now asking for information in certain areas of interest. With respect to these certain areas, Project Civil personnel has been cleared for access to DOD installations, to discuss with research and other technical personnel specified test results in the weapons test field.

This is in addition to their being supplied with suitable reports and data pertaining to the areas specified.

Mr. HOLIFIELD. I hope that difficulty has been somewhat overcome since our hearing of a year ago.

Colonel McHUGH. Yes, sir. I feel confident that the arrangements are going very nicely.

Mr. HOLIFIELD. Let me go further and ask you: Have they taken advantage of the opportunity to obtain this information, and have you had a large number of requests from them for area knowledge?

Colonel McHUGH. Yes, sir. Initially they asked for broad areas with clearance for access to our installations for periods of time of approximately a year. Clearances have been granted. They are going continually to our installations. The year has not expired.

Presumably at the end of the year there will be a redefinition of the areas in which they want to get information and a reconsideration of their request.

Mr. HOLIFIELD. One of the interests of this committee, of course, is to eliminate duplication of research and development projects, particularly in fields which have already been surveyed. It seems quite wasteful for an agency like the FCDA to grant additional contracts in areas which have already been covered by the Armed Forces. We intend to look at some of their contracting arrangements to determine whether that information is already available in the Defense Department and whether it is therefore unnecessary to spend the money for duplicating research and review and study.

Mr. RIEHLMAN. Mr. Chairman.

You are in the operating level of the Secretary of Defense?

Colonel McHUGH. No, sir; the executive level.

Mr. RIEHLMAN. Is it true that all three services have been carrying out experiments in respect to blast effects and fallouts against many types of different structures?

Colonel McHUGH. Yes, sir. Each, of course, has a different kind of requirement. The coordinating element within DOD to bring all of the various results together and keep the test work headed in the proper direction is the Armed Forces Special Weapons Project. In effect, AFSWP runs the DOD atomic weapons test program.

Mr. RIEHLMAN. They would coordinate all the information, bring it together in one focal center?

Colonel McHUGH. To the best of the ability of the people to do that; yes, sir. I am not sure they have everything. I don't believe they would say they do. But the major research effort in the blast, thermal, and radiation effects fields are coordinated by the Armed Forces Special Weapons Project.

Mr. RIEHLMAN. I will get to my next point. That information, then, is readily available to FCDA?

Colonel McHUGH. Yes, sir.

Mr. RIEHLMAN. Can you conceive of any additional tests and experiments that should be carried on in respect to the effect of blasts and fallout other than what the three different services are carrying on?

Colonel McHUGH. I don't believe I am competent to answer that question.

Mr. RIEHLMAN. Are you trying to cover the field as completely as you possibly can?

Colonel McHUGH. Within the limitations imposed first, by the availability of scientific personnel, and then research funds, we are trying to improve our knowledge in all aspects of the nuclear weapons as quickly as we can. Our intent is to cover the more pressing problems in order of priority of need.

In the weapons effects field, I would say the design of the structure was first. We have gone considerably along the path in that direction, however, and now it is the question of accessories which constitute an important part of the shelter research program.

We also are aware that shelters are not the total answer. We tend to think of defense against these effects in terms of a countermeasure system. That is: what are people going to do before they get into the shelter—reaction to warning, for example. In the shelter, how are they going to live and what are the problems associated with living in confined spaces for protracted periods.

Then after the attack, the questions arise: How are they going to exist afterward; what is the mechanism by which nuclear radiation affects us people; what are the means of radiation protection, and so on.

In talking of research, it is not limited, of course, just to the effects on structures. Research must encompass the whole problem of the countermeasures system. There we get into terrific competition for scientific personnel and for research dollars.

Mr. RIEHLMAN. That, of course, is the interest of this committee, to see that where there is a lack of scientific ability, people in the scientific world to carry out this type of program, that we aren't allowing another department of the Government to duplicate the same activities that are being carried on by the Defense Department.

Colonel McHUGH. Because Defense is faced with this competition for scientific personnel, we applaud and support the committee's efforts in this direction. Our attempts to supply to the Federal Civil Defense Administration the results of research which it can use, is based on the concept that there should not be duplication of research efforts.

Mr. ROBACK. However, the Federal Civil Defense Administration, Mr. Riehlman and Mr. Chairman, in this case had to hire an outside agency to go to the military department to find out what they had.

Mr. RIEHLMAN. That's the point I was trying to get to, Mr. Chairman. The fact that the need for FCDA to hire outside contractors for outside assistance to get information from the Defense Department that they have available. It just doesn't seem reasonable and it isn't good sense, and certainly it is lack of coordination as far as I can see, and willingness on the part of the Defense Department or FCDA to work together to get this information to their department.

Colonel McHUGH. Sir, I believe the application of these data that have been developed in our tests and in our research programs, data to the civil defense problem would require work by someone. It is not in our purview to carry out the application of these data to civilian defense work unless we are asked to do it by the FCDA, the agency which has the civil defense responsibility. Essentially what defense is doing is it is either to protect our military capability—

Mr. RIEHLMAN. But certainly that could apply to civilians as well as to military for protection of their lives, for shelter, to live after a blast, and to understand what they are going to have to cope with after that.

Colonel McHUGH. Yes, sir; I agree; and that is why we turn to the agency which has that responsibility. This is not to say that DOD might not do the job of applying data obtained in military research to civil projection had we that responsibility.

But it will still take additional people, and additional work, to apply these data to the civil defense problem wherever the responsibility lies.

Mr. HOLIFIELD. Many of your tests, while they could be applied to problems of civilian protection, were directed primarily toward protection of military equipment and military systems and operating military personnel, rather than even the dependents of military personnel and the general public. Is that not true?

Colonel McHUGH. Yes, sir.

Mr. HOLIFIELD. And therefore where your research would be valuable to FCDA would be in the taking of parts of it such as the testings of materials and stresses and strains from an engineering standpoint, and then applying that to civilian problems. For instance, you may need 100 or 200 pounds per square inch pressure resistant type of building to protect some intricate or complicated electronic equipment that has to do with the firing of missiles, whereas that type of protection would not necessarily be needed in a civilian community.

Colonel McHUGH. Yes, sir; that's correct. To retrace a little bit to what Mr. Riehlman brought up, it is intended that when the Civil Defense Administration does come up with a nonmilitary protective construction package, with respect to civilians, DOD would probably implement that policy in the protection of the dependents of military personnel, for example, which is a nonmilitary problem at the present time.

So there will be feedback from FCDA to DOD to obtain the benefits of their having applied DOD data given to them in developing civil defense measures.

Mr. HOLIFIELD. Has your group been aware of the report that we made last year and the trouble that the contracting groups were having in getting the information from the Department of Defense and the AEC.

Colonel McHUGH. That was the one in connection with the civil defense survival, sir?

Mr. HOLIFIELD. Yes.

Colonel McHUGH. Yes, sir; we have.

Mr. HOLIFIELD. We had a report in 1956 and this is a shorter report in 1957 in which we took up this point that we are talking about now, particularly in regard to the University of California's contract to develop a radiological protection plan for civilians.

If you haven't read that report, I would suggest that you read it. It may be, as you say, some of those things have been taken care of since then.

Mr. ROBACK. Mr. Chairman, members of the Armed Forces Special Weapons Project were witnesses in helping discuss and straighten out that matter.

Mr. HOLIFIELD. We did, of course, refer to them in the report and our findings of last year, on that point.

Go ahead, Mr. Facci.

Mr. FACCI. Each of the military departments has a number of headquarters and field offices engaged in technical research, engineering

studies and operations studies. The Army Chief of Engineers uses the services of the Engineer Research and Development Laboratory, Waterways Experiment Station and Snow, Ice, Permafrost Research Establishment in this work; Chemical Corps, Ordnance (Ballistics Research Laboratory) and other Army research agencies also support their work. The Navy Bureau of Yards and Docks is active in this work as well as Naval Ordnance Laboratory, Naval Research Laboratory, Naval Radiological Defense Laboratory, and the Naval Civil Engineering Research and Evaluation Laboratory, in the field. The Air Force depends principally on Air Research and Development Command, and its field offices, the Air Force Special Weapons Center and the Ballistic Missile Division, and on Rand Corp. and the Air Force Director of Research and Development, Air Force Intelligence, and Air Force installations in headquarters. The Armed Forces Special Weapons Project is the agency used in coordinating and managing the DOD activities in nuclear weapons tests. It reports directly to the Secretaries of the three departments and, for certain assignments, it reports to the Secretary of Defense. Its main responsibilities are to screen and develop weapons test projects, manage the military participation in full-scale tests, determine the validity of research and supporting data in justification of full-scale tests, and effect liaison with other agencies such as Atomic Energy Commission, the Civil Effects Test Group and the Federal Civil Defense Administration.

We feel that the work done at full-scale tests is in itself only a small part of the problem of obtaining answers. A project is conducted at a test site only after everything possible is done by analytical and laboratory-type research.

It is hoped and believed that the many research studies, both laboratory and theoretical, which DOD agencies have sponsored during the past 10 years, have been of some considerable value in forming the basis for the field tests and designs which have been carried out by the CETG and FCDA. Data on a number of the projects—this is the same area which we were just discussing—have been made available to them but, probably of greater value, the non-DOD agencies have been able to utilize the DOD contractors and consultants in planning their field tests and designs, thereby indirectly getting access to the technical know-how developed during the past 10 years.

The military departments are currently carrying out about 25 projects in the field of weapons effects and engineering related to protective construction. These include such subjects as "Design and Fabrication of Blast Closure Devices," "Analysis of Cratering Data," "Weapons Effects in Arctic Terrain," "Response of Soils to Dynamic Loads," et cetera—these are only given to illustrate the type of projects. Although it is often difficult to separate entire projects, or parts thereof, which contribute to protective construction from those which contribute only to general knowledge and to other fields of knowledge, an estimate is that this research program, for all 3 departments, has averaged about \$900,000 per year for the past 3 years. Control and coordination of this program is effected in OSD by the Assistant Secretary of Defense for Research and Engineering through project funding review actions, and by the Armed Forces Special Weapons Project in connection with management of the field test program.

The Department of Defense has taken part in every nuclear weapons test beginning with the first, Operation Trinity in 1945, with programs designed to develop the knowledge of the effects of nuclear weapons and of the ways and means of protection.

As a matter of fact, the results of the two Japanese weapons were also studied very carefully soon after their occurrences. The earliest major efforts were expended on the understanding of the basic phenomena, that is, the character of the air blast, and thermal and nuclear radiation resulting from nuclear weapon explosions.

Efforts in later tests have been designed to develop ways and means of protection. Quite naturally, the military laboratories that had done research and experimental work with conventional weapons were utilized in the new field.

The DOD program at Plumbbob in Nevada, in 1957 consisted of 9 projects on structures and 11 projects on basic phenomena and effects data.

Interim test reports have been published on all of the 1957 Nevada projects. Many have been made available to FCDA. The military departments, in their presentations, may provide additional specifications on these tests.

In addition to the studies associated with participation in Exercise Alert, in recent years there are a number of additional operations type studies within OSD which contribute to planning of military protective construction. The Weapon System Evaluation Group has current studies on the protection of SAC bombers and missiles.

A countrywide damage assessment study was reported by S & L last year and a similar one is being developed for this year, in cooperation with the National Damage Assessment Center. All of these studies treat some elements of the protection of the civil population.

The Rand Corp. has made studies on the protection of SAC aircraft, SAC missiles and on active defense forces. The Air Force Intelligence Staff has also published reports on "Vulnerability of Targets" which includes estimates of damage to numerous structures and equipment items.

Numerous engineering design studies have been made. Foremost among these are the Air Force's fallout shelter designs and oversea underground site study and the Army's preliminary design of numerous aboveground and belowground blast-resistant structures and extensive study of underground construction, existing mines and caves in the United States. Some preparations have already been made for possible eventual provision of fallout shelter. The Navy has adopted a "slanting" policy in new construction; it provides inclusion of structural and layout characteristics which contribute better protective features. The Navy has issued definitive layouts and engineering instructions covering "slanted" construction. The Army has prepared new designs for barracks which will permit eventual economic addition of basement shelter spaces. The Air Force shelter study, and its emergency fallout shelter plan, also has evolved such designs.

In addition to the studies and designs for provision of general shelter area which have been heretofore stated, the Navy has actually implemented its "slanting" policy, in fiscal year 1957 and fiscal year 1958, to the following extent:

(a) Type of facilities—nonoperational; enlisted men's and officers' quarters, academic buildings, administration.

- (b) Number of such facilities 16 (9 locations).
- (c) Total construction cost \$30,700,000.
- (d) Cost of protection \$437,000 (1.4 percent).
- (e) Nature of protection—generally consists of reinforced floors, walls (including some shear walls). More specific data on degree of protection is not determinable because of the nature of the protection.

The concept of "slanting" has been to provide some unpredetermined degree of protection, at no appreciable cost, by appropriate architectural and engineering practice. As applied at present, "slanting" is included only on a "no additional cost" proviso.

Utilizing the findings of these studies, it can be estimated that the average cost of fallout shelters for a program of military and civilian personnel at all United States military installations would be about \$300 per person. A majority of these shelters would be separate, underground structures with inherent blast protection up to possibly 50 pounds per square inch. The cost of real estate, food or medical supplies, furnishings, etc. is not included.

Mr. HOLIFIELD. This last testimony you gave indicates, then, that you have had substantial progress in the field of radioactive shelters.

Mr. FACCI. We have made progress in studies in planning for them, Mr. Chairman. We have not made any progress in actual implementing of the program. As I stated in the beginning, our program to shelter people is tied directly to any future national policy. We see that this may be in the offing, or that there is a possibility that it may come about.

Therefore we are concentrating on the engineering, planning, master planning and engineering designs which will permit us to go fairly efficiently to a program of shelters, if such a program is stated for the country as a whole.

Mr. HOLIFIELD. Did I understand you to say that you have designed new types of buildings and barracks which would provide radioactive shelter?

Mr. FACCI. Yes. In fact, all three services have made designs of this type. None of these have been constructed as yet. Of course, I must emphasize that this is one element of providing the fallout shelter. If a fallout shelter program or policy is set up, the conversion or the inclusion of shelter spaces in new barracks that are going to be built will only provide a very small percentage of protection, or protection for a small percentage of the military population.

There will be other types of shelters entirely different that will be required as well. But the one that I mentioned here—the Army concept—is to provide an excavated space, unfinished, below new Army barracks to carry out the work so that in case a shelter program is stated it will be comparatively cheap to go in and finish off the basement and provide access to it.

But I don't want to go too much into detail on that. Mr. Kirkpatrick, who is going to testify for the Army, will cover this subject to some extent, if you so desire.

Mr. HOLIFIELD. We would like to know about it; and particularly we would like to know if any directives have been issued concerning the construction of new military structures for personnel to bring into being something like this, to start it; or if it is just in the study phase, the planning phase.

Mr. FACCI. The directives that have been issued so far all state that these should be considered in planning a construction program. To date there has been no real implementation, no actual construction of such barracks.

Mr. HOLIFIELD. I assume, due to the fact that you are here this morning, you have been chosen by the Secretary of Defense to make this presentation because of your special knowledge in this field. You have been assigned certain responsibilities in the field of properties and installations and shelters pertaining to that?

Mr. FACCI. Yes, sir.

Mr. HOLIFIELD. Have you ever sat in on any discussions in the offices of the Department of Defense which took into consideration the problem of support from the civilian population in case they are not protected; the problem of support for military actions or missions?

Mr. FACCI. The support provided by the military to the civilian population, or vice versa?

Mr. HOLIFIELD. Do you anticipate having support from the civilian population during the time that we wage a war? I am talking about the logistics now of production and supply.

Mr. FACCI. I have not sat in on any discussions that related to the emergency or shortly after the attack period relating to the inter-relationship of the military and civilian population.

Mr. HOLIFIELD. Do you know whether the Department of Defense has given any thought to this factor?

Mr. FACCI. I believe they have, Mr. Chairman. I couldn't tell you, and I don't believe we have people here this morning.

Colonel McHUGH. Mr. Chairman, the DOD concept of civil defense is targeted toward maintaining the civilian population to support the active military effort. In a sense, everything we have done to support civil defense has been done with the hope that the civilian population could be able eventually to take care of itself and to insure its own survival, so that as soon as the immediate disaster effects of the attack had been overcome, the Nation could get back to restoring our combat capability.

Mr. HOLIFIELD. I understand that you have hope, but I am asking you if you have done anything. Have you included in your war plans any element of continued logistical support from the civilian part of our economy? Will your initial and succeeding military missions depend upon the logistics of supply and transportation which you have depended upon in past wars?

Colonel McHUGH. To the extent these civilian logistical facilities are available, yes, sir. The whole answer would take more research, and some little digging. I would appreciate being allowed to supply a supplemental statement with respect to your question, sir.

There have been a number of things done. For example, we have been working with the Office of Defense Mobilization in establishing a list of survival items which must be protected. There have been some discussions about selected installations.

These matters I am familiar with only to a limited extent, and therefore not qualified to elaborate on and speak of them.

Mr. HOLIFIELD. Who would be in the position of being able to answer the questions in this field? To whom should this committee address its inquiries?

Mr. FACCI. I believe the Secretary for Supplies and Logistics would be the logical place. We can certainly refer this question to them and provide you with a statement on the subject.

Mr. HOLIFIELD. The reason I ask the question is this: Wars of the past have extended over long periods of time. Those periods of time have been used both to mobilize your Armed Forces for their military missions, and also to mobilize the resources of the economy for continued support in the field of supplies, military equipment, food and other things.

The conditions of warfare having changed as they have due to these large-sized weapons and their radioactive content, which brings additional hazards to civilian populations, it would seem that if the military mission is to be carried out, one of their primary concerns would be the protection and continuity of this civilian support.

You have depended upon that in the past. Wars could not have been fought without continuous production of aircraft factories, steel mills, food supply, and all those factors. If the new type of hazard of war threatens all of that, as a great many people think it would, it seems to me that this would become an integral part of your military planning. If this area was neglected—as it has been by the Defense Department—and as far as I know there has been no recognition of the changing hazard of war to civilian populations and production standards—then it would seem to me that you are building your military offense and defense on a very precarious base; you lack the historical backup which you have always had in wars in the past for the continuance of a war of the type that we might have.

If you are planning on just fighting the war with that which you have in being and at hand, maybe this would justify complete indifference as to the continuity of your civilian sources of supply.

Mr. FACCI. I know we don't have the personnel and are not prepared to discuss this particular thing this morning, unfortunately. I know that there are a number of groups in the Secretary of Defense's office, and I believe also in the military departments, who have looked into this question and are continuing to look into the problem.

There has been, as far as I know, no implementation of a program such as, let's say, strengthening of industry or relocating industry.

I won't go into the ODM policy statements; but may I suggest, if this will satisfy you, that we can take this question up immediately with the people who we know have done some work in this area and provide you a statement; the statement may be classified—I don't know yet.

Mr. HOLIFIELD. I would appreciate, of course, your furnishing to the committee any statement which you can furnish. But I would say this: If this matter has not been a matter of primary concern to the Defense Department, then in my opinion you are overlooking the realities of the modern nuclear age and are probably building your house upon the sands.

Mr. FACCI. I don't think that I could at this time—not knowing the details of it—say that we have not been concerned with this in the Department of Defense.

Mr. HOLIFIELD. Concern can only be proven when it leaves the field of academic concern and becomes of enough concern to cause the Defense Department to make recommendations in this field to maintain their base of supply and support.

I am inclined to think that this concern does not exist. I will be glad to have information to prove that I am wrong.

Mr. ROBACK. Mr. Chairman, may we inquire at this point whether Colonel McHugh or any other witness is prepared to advise us about the civil defense planning activities of the Department of Defense?

Mr. FACCI. Civil defense planning activities?

Mr. ROBACK. Yes. The question came up yesterday in a discussion with the director of the ODM as to the extent of his knowledge of the civil defense planning by the Army under designated responsibilities of the Continental Army Command. Are you familiar with that, Colonel McHugh?

Colonel McHUGH. Yes, I am, Mr. Roback. As part of the Department of Defense planning to assure the protection of civilians in the event of an attack, we have delegated from the Office of the Secretary of Defense to the three departments responsibility for providing military assistance to civil defense. To insure that there is a coordinated effort, the Department of the Army is the principal coordinator and is responsible for controlling the application of military assistance by the three services for civil defense.

We have an arrangement whereby each of the six Army commanders under the Continental Army Commander at Fort Monroe has a direct liaison with his opposite regional administrator of the Federal Civil Defense Administration and with the chairman of the corresponding Regional Mobilization Committee of the Office of Defense Mobilization.

The contact between the commanding general of an Army and the FCDA's regional administrator is set up so that when the States or the cities have a major requirement for military assistance the request will be sent by the regional administrator of FCDA to the Army commander with a designation of the priority in which the facilities, the equipment, the manpower which the Army commander can make available, will be furnished to the civil authorities involved.

Mr. HOLIFIELD. We have had extensive hearings on this point, Colonel. The record, for your information, contains all of this. It also contains the fact that your regional or local military commander has the primary military mission to perform, which is of course proper.

Any assistance which he may furnish upon request of the local people is completely incidental to their primary military mission and is not to be depended upon by the local people in any way. This has been well established by testimony of military personnel.

So while we realize that this paper system exists, it still does not afford any dependable or measurable support from the military in case of emergency within any specific area or region. This is not to disparage the military's willingness and intent to serve where they can, but it is to place in proper perspective their capacity and their authority and mission which they have.

Mr. ROBACK. Mr. Chairman, may we get from Colonel McHugh, from a proper source, the planning assumptions of CONARC under their latest formulation which was mentioned by General Wyman in a recent public statement?

Colonel McHUGH. Yes, sir, I will be glad to supply this information. But I believe you already have it in the CONARC DEPUS-57, the short title for the United States Continental Army Command

Domestic Emergency Plan, which was submitted to the committee last year.

Mr. ROBACK. Is that the latest statement?

Colonel McHUGH. To the best of my knowledge it is; however, I will check.

Mr. ROBACK. Will you refer to General Wyman's public statement—which we will identify for you later—and determine whether there has been a more recent formulation than we received last year?

Colonel McHUGH. Yes, sir; I will be glad to.

(The material referred to was subsequently submitted for the subcommittee files.)

Mr. FACCI. I simply have a concluding statement, Mr. Chairman.

In summary, the protection of the military missions is basically an operational problem. It is established as part of the total mission concept. The protection of personnel as such will be a direct reflection of our national program.

The protective construction, operational protective construction, has started, although it is still on a relatively limited scale. Its scope will change as new weapons and operational concepts are introduced.

Although research and testing will continue for some time in order to improve technology, there is an adequate knowledge now to permit reasonable designs of all but very large and complex structures to levels of about 200 pounds per square inch. There are many points of contact with civil agencies such as exercise, alert, symposiums, and so forth; but probably the most productive is in the area of field testing.

In this connection it is believed that the DOD basic research and theoretical studies have proved beneficial to the other agencies.

Along with this we have prepared a number of technical publications, particularly the Effects of Nuclear Weapons prepared by the Armed Forces Special Weapons project, and the Engineering Manual for Protective Construction by the Corps of Engineers, which are generally available for use.

In turn we have derived real value from the work of the AEC, ODM, and FCDA. We are staffed and organized to carry out protective construction programs to maintain close liaison with the other agencies.

That is my statement, Mr. Chairman. If there is no question on any part, the next witness would be Mr. Kirkpatrick of the Army.

Mr. HOLIFIELD. Do you have any questions?

Mr. ROBACK. Does your office screen all these research and development and experimental projects?

Mr. FACCI. We do not. The Assistant Secretary for Research and Engineering and the Armed Forces Special Weapons Project within the Department of Defense, do this type of work, particularly in relation to support of field tests.

Mr. ROBACK. Is it the contention of the Department that the various contract studies and other work, of which we have a copy for the Air Force, are not duplicative studies?

Mr. FACCI. You can't avoid duplication to some extent. I think if you search through you will undoubtedly find some duplication. We certainly don't want duplication. I think we are pretty well

organized to avoid it. There is a minimum, I would say, of duplication.

Mr. ROBACK. The problem that seems indicated is that a lot of these studies are basic studies which are not unique to a service mission or role. For example, if the Air Force is studying radiological shelters, many of the considerations are not unique to the Air Force.

The question is whether we have reached a point of saturation in certain fields. Everybody and his brother has a contract to study radiological defense.

Mr. FACCI. All I can say is that it is something we avoid. There are many aspects to be considered. Radiation, of course—as you know better than I do—has been in the past few years a major new field. There is a tremendous amount of knowledge or information that has to be developed.

In doing this, especially over a short period of time, you are bound to find people who step in each other's tracks. But we believe that there is certainly no knowing duplication or intended duplication.

The Armed Forces Special Weapons Project screens and coordinates project proposals for full scale tests. Various offices under the Assistant Secretary of Defense for Research and Engineering screen, approve and provide coordination for other forms of research. The AFSWP does provide for dissemination of the results of these other forms of research to all interested agencies.

Mr. HOLIFIELD. You may present your next group.

Mr. FACCI. Mr. Martin Kirkpatrick of the Army Corps of Engineers.

Mr. HOLIFIELD. All right, Mr. Kirkpatrick, you were here before us on other hearings. We will be glad to hear from you.

**STATEMENT OF M. D. KIRKPATRICK, CHIEF, PROTECTIVE BRANCH,
OFFICE OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE
ARMY**

Mr. KIRKPATRICK. I have a very brief prepared statement. I can pass out a few copies of it.

The Department of the Army in a letter to your subcommittee dated January 28, 1958, furnished information in reply to three specific questions contained in the letter from your staff director requesting information regarding the shelter program.

I have been designated to furnish further detailed information to the subcommittee.

In response to the first question regarding studies which bear upon the providing of shelters against nuclear weapons effects for military personnel or facilities, the Chief of Engineers during the past 10 years has initiated and sponsored numerous studies and investigations for the purpose of developing design criteria for surface, subsurface, earth-covered, and underground facilities to protect personnel and materiel from the effects of nuclear weapons. The information and design criteria derived from these studies are applicable to all types of shelters.

These studies were accomplished by contracts with the Massachusetts Institute of Technology, the University of Illinois, Lehigh University, Stanford University, Stanford Research Institute, and with

engineering firms, such as Guy B. Panero and Ammann & Whitney.

Investigations have been conducted through working fund agreements with other Government agencies including the United States Bureau of Mines, the National Bureau of Standards, and the Navy Radiological Defense Laboratories as well as the district and division offices, the Engineer Research and Development Laboratories and the Waterways Experiment Station of the Corps of Engineers. Full-scale structure effects tests have been conducted at the Atomic Energy Commission's Pacific and Nevada Proving Grounds.

The Chief of Engineers has recently completed or is completing several engineering manuals reflecting the results and analysis of these many tests and investigations for the use and guidance of field offices of the corps and engineering firms engaged in military construction.

They are being used by the Navy and the Air Force and copies are furnished to the Federal Civil Defense Administration and other Government agencies desiring them.

The series includes manuals on the Design of Structures to Resist the Effects of Atomic Weapons; Underground Construction in Rock (portions of this manual are classified); Heating and Air Conditioning of Underground Installations; and Collective Protection Against Chemical, Biological and Radiological Agents.

Some of these are still in draft form but, when published, copies are being furnished to a large number of designated libraries where they are accessible for reference use. The design procedures reflected in several of these manuals have been used for certain structures tested at both the Pacific and Nevada Proving Grounds and have proven to be adequate.

A current study of the Chief of Engineers which is becoming of considerable interest involves comparative cost studies for several types of aboveground, earth-covered and buried structures for several levels of blast overpressure and radiation effects, ranging from 10 to 30 pounds per square inch for the aboveground buildings, and 25 to 200 pounds per square inch for the earth-covered and buried structures.

In 1956, a study of total Army requirements for protective construction was made and submitted to the Office of the Secretary of Defense. Conclusions of this study emphasized the necessity, cost-wise, for dispersal of indispensable and vital facilities from target areas, thus requiring less costly shielding from radioactive fallout as differentiated from the more costly construction required for blast protection.

In regard to the second question on plans for providing shelters against nuclear weapons effects for military personnel, equipment and facilities, current planning by the Department of the Army is oriented toward protecting against the effects of nuclear weapons those activities whose continuity of operation is considered indispensable or vital from the viewpoint of survival and retaliation in the event of nuclear attack.

In this connection such activities are being sited, insofar as practicable, away from potential target areas to minimize the requirement for construction features resistive to both thermal radiation and blast overpressures.

Examples are key operational structures for Missile Master, underground storage magazines and control rooms for NIKE sites, and communications installations. I might add that we are also considering the feasibility and practicability of providing sheltered basements in any future construction of barracks, hospitals and dispensaries.

Initial funding of the Army's long-range program for protective construction was approved in the fiscal year 1958 military construction, Army, program to the extent of \$3.7 million for protective features. This figure represents the cost increase over and above conventional construction costs.

In answer to the third question as to what components are engaged in atomic design or shelter work, the Chief of Engineers is responsible for design and construction for the Department of the Army and is engaged in atomic shelter design and construction work to the extent that such projects are specifically authorized.

Such projects include the Fort Ritchie installation, the Armed Forces Institute of Pathology Building at the Walter Reed Hospital, the SAC Control Center at Offutt AFB, and certain command, tactical and storage facilities of classified nature.

A list of the investigations and tests to develop atomic weapon resistant structures is included with this statement which I will not read. I thought they might be of some interest. It is rather lengthy and possibly the committee already knows of some of these from the previous hearings.

Mr. HOLIFIELD. Can you give us a complete group of copies of the manuals that you referred to here, and also such additional manuals as are not mentioned here that are unclassified.

Mr. KIRKPATRICK. I will have to do that later, sir. I have with me one copy of one of the series on Atomic Blast Resistant Structures. I am wondering if possibly this might meet your initial requirements.

On pages 1 and 2 is a list of all of the sections of this series. I won't read it. There are nine sections to this manual. This is representative of what is in all of them.

Possibly to have all of them is not going to be much better than to see one of them.

Mr. HOLIFIELD. We will let the staff look this over, and if they want anything special, they can take it up later.

Mr. KIRKPATRICK. I have two others of that same type—the one on Collective Protection Against Chemical, Biological and Radiological Warfare Agents—one section of that; and also one section on the manual on Heating and Air Conditioning of Underground Installations, which I can also leave with you.

The other one which is classified, is only in draft form; and I think it would be a little difficult right now to give that to you.

Mr. HOLIFIELD. We do not want that at the present time. We are not asking for that. Any questions of Mr. Kirkpatrick?

Mr. ROBACK. Mr. Kirkpatrick, you speak for the engineers. Are there any other Army services, technical services, which conduct studies in this field?

Mr. KIRKPATRICK. Yes, sir. The Chemical Corps, the Signal Corps, the Ordnance, are interested in weapon effects on equipment and material. I am from the Corps of Engineers, and am, I think, the only Army representative present at these hearings.

Mr. ROBACK. Is it feasible to present us with a list of contracts similar to the Air Force for the whole Army effort? Or would that be a project that would take many months to compile?

Mr. KIRKPATRICK. Sir, in the field of structures, shelters and structural designs which would provide shelter, I don't believe any other Army technical services are in that line. The Chief of Engineers does that type of work, and all the other technical services look to us for their design.

In fact, that is our function—to design structures for the use of the other technical services.

Mr. HOLIFIELD. They are not granting other contracts, then?

Mr. KIRKPATRICK. No, sir.

Mr. HOLIFIELD. Or negotiating any other contracts for these purposes?

Mr. KIRKPATRICK. No, sir; only insofar—as in the case of Ordnance, for example, they have certain special requirements for ammunition loading or powder contracts where a commercial firm will establish requirements and turn those over to us for design and construction.

That is a little out of this field.

Mr. ROBACK. We won't challenge your statement, Mr. Kirkpatrick, but we will ask you to verify it. In other words, will you see that the appropriate agency at the G-4 level makes a check for us of the services in the field of shelter and matters that are related and direct that to us? We want, in this record, to get together some relevant information here so that at least people who are interested in this can be aware of it.

Mr. KIRKPATRICK. The tactical requirements within the Army, of course, in the line of field fortifications, pill-boxes and that sort of thing are under the Army commands—they do not usually get into a type of permanent construction such as we deal with in connection with Military Construction (MCA) programing.

All of the operations in Nevada, for example, under the heading of "Operation Desert Rock" include many tests of field fortifications and that sort of thing but which I don't believe are generally done by contract. So I don't know whether your question as to contracts—

Mr. ROBACK. What we are trying to get at is this: We are here just looking at random at any items on the Air Force list. There is an unclassified contract study of the effect of long versus short duration of blast loadings on structures. I can understand that that can be made at different times with different kinds of weapon assumptions, but also maybe two agencies are studying that for the same thing.

At this stage the committee doesn't have any full assurance that these studies are not being simultaneously prosecuted, if not within the services altogether, maybe throughout the whole Government.

Mr. HOLIFIELD. For instance, we see here in the Air Force that they have a study at the University of Illinois on Operation Plumbbob. We see you have listed here also studies that seem to be along the same line for the same tests. I am not sure; it would have to be analyzed.

Mr. KIRKPATRICK. I might say that during full-scale tests such as Operation Plumbbob, Teapot and so on, quite often one group will be engaged in test programs for several agencies. That doesn't necessarily mean they are doing the same program.

Mr. HOLIFIELD. It doesn't necessarily mean a duplication?

Mr. KIRKPATRICK. No, sir. Again in the full-scale test operations, there is a rather close coordination by Headquarters AFSWP to avoid duplication. In other words, sometimes it might be unnecessarily restrictive in that quite often we have programs deleted which we would like to do which somebody else is doing.

However, we all participate in the information that is derived. There is a very good exchange of information and test data. Whether we do or someone else does it, we can still use the information.

Mr. HOLIFIELD. I know you can, but do you?

Mr. KIRKPATRICK. Yes, sir; we do.

Mr. ROBACK. One of the problems here is that E. H. Smith & Co. was hired by the Air Force to give them a suggestion for a protective construction program. Presumably in this exchange and interchange of information, Smith will come to the Corps of Engineers to get advice to fulfill their contract.

It may be that in some case the Corps of Engineers is fully competent to advise the Air Force as to suggestions for a protective construction program, I would assume.

In other words, every time a problem comes up there has been a tendency to go to a contractor. A lot of this information is around. The people who have to perform the contract come to these sources of information, and the Government spends extra money in giving them the information, and the net value of the contract is minimal, not only because a lot of people study the same thing but because the contracting agency may be prosecuting two contracts simultaneously for two different agencies, and he is using the same information, making a bonus on one.

We find that all the time in some other fields. There doesn't seem to be any effective control over that. We are in an age of research and development and that has become an important thing, but nobody is considering how we can get the optimum value from our limited talents in this field.

Mr. HOLIFIELD. The optimum value at least is being considered on the point of the dissemination of that information to all the departments that need it, and also the screening to prevent duplication by agencies of studies that have been made.

Mr. KIRKPATRICK. On investigations programs—which of course would not involve full-scale test participation, each service—I say each service; I know insofar as the Chief of Engineers is concerned—we can only go into investigations which we feel are necessary to fulfill the Chief of Engineer's responsibility for design and construction within the Army.

The relatively few investigations we have had of that nature where we have used our own funds rather than participating in an overall program have generally been oriented toward things that we see are necessary to meet the requirements which we know exist or may exist in the near future.

As to what the Air Force contracts are in this same field, I am not in a position of course to know that; the Air Force has representatives here. But I rather suspect that some of the contracts—while they may sound like the same—are perhaps oriented in a little different manner.

The Air Force has other requirements such as enemy construction from the standpoint of its behavior under our attack and that sort of thing. Normally the Corps of Engineers would not go out solely to determine how strong an enemy structure is because we normally are not engaged in bombing or destroying that.

Mr. HOLIFIELD. We have great respect for the Corps of Engineers and the work that it has done over the years. We have been cognizant of their work down there for some time.

Would this be a fair question if I would ask you: Has it ever come to your attention that the accumulated information which you have on structural designs, architectural and so forth, was being duplicated by other divisions in the Department of Defense.

Or would you like to answer that question?

Mr. KIRKPATRICK. I would prefer not to answer it because I am not in a position where I can observe or coordinate all the programs of all of the services.

Mr. HOLIFIELD. You know there is a lot of complaint up here right now. In fact, I understand there was some discussion over in the Armed Services Committee as to the reorganization plan which the President has sent up here. The ostensible purpose of it is to eliminate some of the duplication which is alleged to obtain in the function of the three services.

I am not passing any judgment today on the validity of this plan one way or another. But there is a growing concern on the part of the people and of the Congress in regard to duplication of effort and failure in some instances to take advantage of information which has already been accumulated, not only in the Department of Defense, but in other departments, such as the Federal Civil Defense Administration. There doesn't seem to be any liaison or any knowledge of some of these areas of knowledge which have already been explored and accumulated, and they go off on their own and make contracts which many times are duplicative, it seems to us, of work that has already been done.

Mr. KIRKPATRICK. Within the Department of Defense, I don't believe any agency—Army, Navy, or Air Force—can spend money for investigations or tests or research unless it had been contained in an appropriation bill somewhere as research, development, or otherwise. Every program is screened within the Army at Army level by several officers. It goes to the Department of Defense. It goes to the Bureau of the Budget through the usual channels. So I don't believe any of us can be spending money without having justified it first.

The extent to which duplication can be avoided, it seems as though the means of avoiding that does exist, but the extent to which these higher echelons will reject a program of one service because some other service appears to be doing the same thing, I am not in a position to answer.

But I do know that we cannot spend money for investigations until we have prepared a program indicating what we are going to do and what we have done and why we need the information.

That is screened at several levels just the same as any other appropriations are.

Mr. HOLIFIELD. It would be your responsibility, of course, in this field; but we know that over the years the Corps of Engineers has

accumulated a great deal of knowledge on materials, stresses and strains of different types of architecture. We sometimes wonder if some of the newer agencies like the Federal Civil Defense Administration—and I understand you are not answerable to this point—utilize this information, or whether they suddenly decide that they want to find out something and then they go out and make a contract without adequate search of the accumulated material which is available in the Defense Department.

That requires no answer. As I say, I know you are not answerable on that point.

Mr. KIRKPATRICK. I was going to comment that as I testified 2 years ago in the hearings that the Civil Defense did approach the Engineers for accomplishing work for them; or we will say they pumped us for everything we could give them. We have never refused them anything.

As far as I know, they have had copies of any data that we have available. I am sure the committee will realize there are certain areas wherein the Civil Defense requirements may be different from the requirements within the military. On manuals and standards, for example, any data that Civil Defense puts out must meet with local requirements in every part of the country.

The structures which they would build would perhaps be types that the Army or the Corps of Engineers would never have occasion to build.

We in turn have to gear our manuals and engineering instructions and outline specifications to military requirements, and quite often those may not be what Civil Defense needs or could use. The extent to which they use our data of course is something I cannot answer.

Mr. ROBACK. Mr. Kirkpatrick, our letter, I believe, inquires about Army contracts with regard to shelter policies and programs. Shelter policy is in one sense the subject of a study by an Army contractor in the person of the Johns Hopkins University Operations Research Office. At least, they directed themselves to that problem.

Who is the Army contractor for that study?

Mr. KIRKPATRICK. I think that is under the Operations Office of the Army—Deputy Chief of Staff for Operations.

Mr. ROBACK. In other words, that was not a technical service contractor?

Mr. KIRKPATRICK. No, sir. It is from the Army level.

Mr. ROBACK. Is there anyone here from the Army who can respond to a question on that?

Mr. KIRKPATRICK. I believe I am the only Army representative here, sir.

Mr. ROBACK. You wouldn't know anything about that?

Mr. KIRKPATRICK. I know something about it, yes, sir. We furnish them information periodically upon request. In fact, just last week I had a visit from one of their representatives for certain information that we had available. We of course see their reports if they are in the fields that we are interested in.

Mr. ROBACK. What is the significance of the shelter analysis or recommendations so far as the engineers are concerned? Does it throw any light on anything?

Mr. KIRKPATRICK. I am afraid I can't answer.

Mr. ROBACK. I think, Mr. Chairman, we ought to at least have a little explanatory statement from the Army. We did ask about contracting policies as well as programs. We might ask you to convey to the appropriate authority of the Army a request for an explanatory statement of the contract that I mentioned with regard to the shelter aspects.

What use has the Army made of it and what evaluation has it made and what does it think of it?

Mr. HOLIFIELD. Did it supply you with any information which you did not already have in your own files?

Mr. ROBACK. Without any disparagement of the University, again their investigators have got to come to the engineers to get the information to report to the Deputy Chief of Staff, to a certain extent.

Mr. HOLIFIELD. I understand that this study of theirs extended over a period of 6 years.

Mr. KIRKPATRICK. I believe it is almost a continuing contract.

Mr. HOLIFIELD. We had Dr. Johnson before us the first of the week. He testified in regard to their findings. Of course it may be that these people are hired from the standpoint of collecting information from all sources.

Mr. KIRKPATRICK. I think that is not necessarily for collecting information, but I think it serves a function of analyzing operational requirements. I think I can say this safely, in most instances it hasn't affected, we will say, the construction programming of the Corps of Engineers of the Army.

Our work is more in dealing with requirements as developed. If there is a structure which requires protection, it usually emanates from the using agency, and the extent to which they may have used the Operations Research Office, of course I am not in a position to say.

But I believe their studies in general have been more along tactical lines and operations rather than going into requirements for, we will say, permanent structures and so on. What they are doing on shelter studies, I am not in a position to say.

(The following document was submitted for the record by Mr. Kirkpatrick:)

CORPS OF ENGINEERS INVESTIGATIONS AND TESTS TO DEVELOP ATOMIC WEAPON RESISTANT STRUCTURES

1. ATOMIC WEAPONS TESTS

(a) *Operation Greenhouse (1951)*.—Tests of multistory building units involving steel and reinforced concrete structural elements, wall panels, etc., and tests of a composite semiburied personnel shelter.

(b) *Operation Jangle (1951)*.—Tests of scaled high explosives to determine scale relations of effects phenomena and test of various types of structures simulating building frames.

(c) *Operation Upshot/Knothole (1953)*.—Tests of buried structures at depths of 1, 4, and 8 feet to determine structural response at various depths. Also tests of buried shelters, entrances, intakes, etc.

(d) *Operation Teapot (1955)*.—Tests of buried structures to determine effects of underground and air bursts.

(e) *Operation Plumbbob (1957)*.—Blast loading and response of underground concrete arch structures (WES).

2. FIELD TEST PROJECTS

(a) *Underground explosion tests (1947 to 1952)*.—Tests in various type soil and rock to determine effects of cratering, blast, damage to structures and tunnels, and other phenomena.

(b) *Bomb penetration tests (1952).*—Tests to determine the penetration of large air-dropped bombs in rock.

(c) *Small underground explosion tests (1952-55).*—To determine scale relations and effects of small (250 lb.) charges of TNT in various types of soil.

(d) *Survey of selected existing mine sites.*—United States Bureau of Mines.

3. INVESTIGATION STUDIES (CONTRACTS WITH FIRMS AND INSTITUTIONS)

(a) *Studies and Tests on Effects of Impulsive Loads on Structures and Elements of Structures*—MIT.

(b) *Analysis of Greenhouse Test Structures and Preparation of Manual on Interim Design Procedures*—Ammann & Whitney.

(c) *Shear Wall and Wall Panel Studies*—MIT—AFSWP.

(d) *Analysis of Damage to Hiroshima (Nagasaki Buildings)*—MIT—AFSWP.

(e) *Shear Wall Studies*—Stanford University—AFSWP.

(f) *Mechanical Deformation Model Studies*—Stanford University—AFSWP.

(g) *Dynamic Properties of Soil*—MIT—AFSWP.

(h) *Investigation of Reinforced Concrete Columns and Beams*—University of Illinois—AFSWP.

(i) *Analysis of Damage to Underground Structures*—University of Illinois.

(j) *Construction materials and Protective Coating; Contamination-Decontamination Characteristics*—United States Bureau of Standard.

(k) *Air Conditioning and Moisture Control in Underground Structures*—United States Bureau of Standards.

4. PREPARATION OF ENGINEER MANUALS

(a) *Design of Structures to Resist Atomic Weapons*—MIT.

(b) *Design of Underground Installations in Rock*—United States Bureau of Mines.

(c) *Radiological Recovery of Fixed Military Installations*—NRDL for CofE and Bu/Y&D.

(d) *Heating, Ventilation, and Air Conditioning of Underground Installations.*

(e) *Collective Protection Against Chemical, Biological, and Radiological Warfare Agents.*

(The following letter was subsequently submitted for the record:)

DEPARTMENT OF THE ARMY,
OFFICE OF THE SECRETARY OF THE ARMY,
Washington, D. C., June 4, 1958.

HON. CHET HOLIFIELD,

*Chairman, Subcommittee on Military Operations,
Committee on Government Operations, House of Representatives.*

DEAR MR. HOLIFIELD: At your hearings on May 8 on the technical and policy aspects of an atomic shelter program, Mr. Kirkpatrick, of the Office, Chief of Engineers, testified in behalf of the Army. In the course of his testimony, several questions were asked which were outside the scope of the Office he represents, and which he was unable to answer. The purpose of my letter is to clarify for the subcommittee those points that were left unanswered. From the résumé of the proceedings on May 8, I have identified three questions which I shall enumerate separately and discuss each in turn.

Question 1. The first question may be phrased "What value has the military received from a contract with the Operations Research Office for studies pertaining to shelters?"

The Army contracted with Johns Hopkins University, Operations Research Office, for a major study of air defense of the United States, recognizing that in the course of this study some consideration would have to be given to the passive defense aspects of this problem. The completed study, titled "Defense of the United States Against Attack by Aircraft and Missiles," includes a portion which touches on civil-defense aspects. Chapter 10 of the main report, which has been furnished your subcommittee, discusses shelters.

Question 2. The second question may be phrased "Has the military used the information produced?"

The information produced was of value, since it insured that all aspects of the air-defense problem were considered. This investigative approach permitted evaluation of the balance between the three factors of strategic attack forces,

active defense, and passive (civil) defense. No specific action by the Army with respect to the limited investigation of the shelter problem is required or intended, but consideration of the passive aspects of air defense is helpful in planning the composition of active defense forces. The information relating to civilian defense shelters has been furnished to the Federal Civil Defense Administration staff in Washington and to the national headquarters in Battle Creek, Mich.

Question 3. The last question concerns whether the work by the Operations Research Office has resulted in any duplication with other studies.

The limited investigation of the shelter problem by ORO is not considered to duplicate any of the studies being conducted in this area by the Corps of Engineers, nor to have duplicated to any significant degree civil defense studies being conducted by other agencies of the Government. It is rather a condensation, presented in narrative form, of some 26 references examined in connection with the study.

In the course of several years of study of various defense problems, Dr. Ellis A. Johnson, the Director, Operations Research Office, has acquired a considerable background of knowledge of air defense matters to include some of the civil defense aspects of the problem. He is especially well qualified to testify on this subject before your committee. He is a gifted scientist of national repute and has served the Nation in several capacities. For example, he is a member of the Rockefeller Foundation panel on the military aspect of international security. It should not be concluded, therefore, that Dr. Johnson's statements before your subcommittee represent views and convictions resulting solely from studies pursued for the Army.

I trust the information I have provided answers adequately the questions raised by your subcommittee. Should you require additional detail, I will be happy to provide it.

Sincerely,

J. H. MICHAELIS,
Major General, GS, Chief of Legislative Liaison.

Mr. HOLIFIELD. Are there any further questions of Mr. Kirkpatrick?

Mr. LIPSCOMB. Mr. Chairman?

Mr. HOLIFIELD. Mr. Lipscomb.

Mr. LIPSCOMB. Mr. Kirkpatrick, Operation Plumbbob is listed for 1957. On our list it was a Corps of Engineers investigation test. Item No. (e) is "Blast loading and response of underground concrete arch structures," and then in parentheses it says (WES).

What kind of an investigation was that, and did you work with anyone else?

Mr. KIRKPATRICK. The WES indicates Waterways Experiment Station. They were the group that handled that. The structures were of a type which they would like to have for possible use in forward areas, which could be perhaps constructed by engineer troops as opposed to the type of structure that you could build in a rear area where you could go into a contract.

The structures were designed using generally the design procedures as set forth in these manuals such as were furnished earlier.

Mr. LIPSCOMB. Did the Corps of Engineers design and construct them?

Mr. KIRKPATRICK. They were designed by a contractor, Ammann and Whitney in New York. I wasn't the project officer on that and I am not with the Waterways Experiment Station.

Mr. LIPSCOMB. On this other list—this is an Air Force list—they have listed ITR, 1425, Operation Plumbbob, project 3.6, full-scale field test of dome and arch structures, October 1957.

They had a contractor, American Machine & Foundry Co. Is there any relation between those two?

Mr. KIRKPATRICK. They were not the same types of structures. The strengths, the designs were considerably different. The engineer structures that were tested at Plumbbob were completely buried, completely subsurface.

I believe this project you are referring to—I don't recognize it by that number, but I believe those were mounded arches or domes above the ground surface.

I am getting in a field which perhaps the representative from AFSWP on this coordination of projects and duplication and so on might be in a better position to answer. They are not the same project. They are not the same types of structures. The behavior, the instrumentation, the effects on those structures, are mutually of interest to both services.

In other words, we were as much interested in the behavior of these arches of the type that American Machine & Foundry tested under that program as perhaps they were in the ones that the engineers tested under our portion of the test.

Mr. LIPSCOMB. Does your report have any classification?

Mr. KIRKPATRICK. The interim report is confidential. However, certain information has been released by AFSWP—again I am not sure—perhaps Colonel Pickering of Headquarters, AFSWP could answer.

Mr. LIPSCOMB. Would these reports be in the hands of FCDA at the present time.

Colonel PICKERING. Yes, sir.

Mr. HOLIFIELD. Both reports would be available.

Colonel PICKERING. If I might say something about these projects in question. The concrete arch project referred to first of all was originally a joint Army and Navy project. As has been suggested here, our position—AFSWP's position—is very often one of getting the right agency to do the right job.

In this case the Army was actually chosen to do it as a joint project. In another case, another structural type, using corrugated metal types, was a joint Army-Navy project, and the Navy was chosen as the agency in that case.

The dome project, the FCDA 30.1 project—was actually a joint project. It was jointly conducted and reported. We were trying to work together with the FCDA in this particular project. There are other projects where we work together.

They have a requirement and if one of our agencies is the best one to do it, that is the way it is done.

On the three projects under discussion here, the concrete arch underground shelter, the corrugated steel one, and the domes there is a free interchange of information.

Mr. HOLIFIELD. Did you folks handle that corrugated quonset hut type?

Colonel PICKERING. Yes, sir, except for the shelter that was shown you during your visit to the Nevada Test Site. We did not actually manage that project. It was conducted by the NRDL for the CETG (Civil Effects Test Group, AEC).

However, the design was exactly the same as similar structures in the Frenchman's Flats area under the project conducted by the Navy's Bureau of Yards and Docks.

Mr. HOLIFIELD. Some of the members of this committee visited those structures out there. I personally did go through these different types. Do the military services, by the way, contemplate the use of this quonset-type structure or some other type for personnel shelters?

Mr. FACCI. In the cases where separate shelters were required, that would be the type of structure to use, yes, sir.

Mr. HOLIFIELD. Underground?

Mr. FACCI. Yes, sir.

Mr. HOLIFIELD. We haven't received exact costs on that structure yet. It would seem like to me it would be one of the cheaper forms of structure that was tested out there, and yet it seemed to hold up pretty well.

Mr. FACCI. Yes, sir. The Department of the Navy this morning will have some costs to give you on this structure which is similar—well, there are the two types of structures.

Mr. HOLIFIELD. If you have more accurate figures and costs on this computation, could you submit them?

Mr. FACCI. Yes, sir. Our main purpose is to indicate that it will be less probably than a billion dollars. It may come out considerably less than that. We can't be sure. We had seen figures in the presentation of AEC and FCDA of the order of \$20 billion and higher. We wanted to at least give you a general picture of where the military counterpart of that would be.

Mr. HOLIFIELD. You see the use of general figures sometimes becomes deceptive unwittingly. For instance, we had some testimony here of building shelter 800 feet under the city of New York in rock, which ran up to fantastic sums. This type of a thing ordinarily is picked up, you know, without regard to the thinking behind it, and sometimes it creates a false impression in people's minds.

Mr. LIPSCOMB. Do I understand that the Army, Air Force, and Navy are each conducting programs to investigate the possibilities for fallout shelters for civilians?

Mr. FACCI. No.

Mr. LIPSCOMB. This Army study, \$1 billion, is for civilian program, isn't it, for the Army?

Mr. FACCI. One billion dollars? This is not a study. I am sorry. I don't quite follow you.

Mr. LIPSCOMB. The one you have been quoting, \$1 billion for 2 million people, is for whom?

Mr. FACCI. That is a construction cost for all military personnel and civilian personnel in the Department of Defense on all continental United States bases, posts, camps, and stations, and some factor was included in that for housing.

In other words, it would take care of people both at their place of work and at their homes, since you can't always depend on them being at one place only.

Mr. HOLIFIELD. This is quite vague, then, and we couldn't depend on it?

Mr. FACCI. The figure was only put in there as a matter of comparison. A better statement, in order to avoid any misuse of the data, might be that the cost for the military personnel, or the military people, would be very, very much smaller than the cost of the civil program.

Mr. HOLIFIELD. Will you provide us a memorandum which will clarify this testimony and make it a little bit more accurate as to the number of people involved and the probable cost and what the figure includes in the way of protection?

Mr. LIPSCOMB. This study was done by the Army?

Mr. FACCI. It was done by all three military departments and the Secretary of Defense. It was a study that was conducted over a period of less than a week, and it was strictly in order of magnitude units. We did want to know whether we would be in the order of \$100 million, \$1 billion, or \$10 billion in a program of this type. The indication is quite good that it will be less than a billion dollars. It may be half a billion dollars.

We are not quite sure. It is in that range.

Mr. LIPSCOMB. But you were basing the study on a specific design or theory, weren't you?

Mr. FACCI. No; we assumed that this one shelter we have been talking about would not be the only one built all across the country. There are certain areas in the country where the possibility or the probability of a high radiation level would be relatively small. Therefore we made a number of assumptions concerning the degree of hazard and the degree of protection, the type of protection, that would be provided.

It was not all high protection, not all structures or facilities would have a shielding factor of say 1,000 or any blast resistance.

Mr. HOLIFIELD. As a matter of fact, this is a very vague statement on your part.

Mr. FACCI. Certainly.

Mr. HOLIFIELD. On second thought, you probably regret that you made this type of a statement.

Mr. FACCI. More and more.

Mr. LIPSCOMB. How long ago was this study made?

Mr. FACCI. Within the last 3 months.

Mr. HOLIFIELD. Was it made in contemplation of coming up before this committee on this subject?

Mr. FACCI. No, sir; it was not.

Mr. HOLIFIELD. This is the kind of testimony which we find to be practically worthless and even damaging, I am sorry to say.

Mr. FACCI. Did you want a followup statement on that, sir?

Mr. HOLIFIELD. I would like to have a little clearer statement on this than you have given us. Pin it down, if you can, and put in it the assumptions which you have made in order that we may know to what degree you have really considered this problem.

It is the Chair's opinion that the subject of personnel shelter has been very incidental in the councils of the Department of Defense.

You have another witness, I believe. Whom do you wish to put on next?

Mr. FACCI. There are two witnesses from the Navy who would follow. Mr. Chairman—Commander Howe of the Naval Operations.

Mr. HOLIFIELD. Commander Howe, will you now proceed? We hope you can give us some definite information on the cost of your structure out there and the results in terms of radiological protection and blast protection.

**STATEMENT OF COMDR. G. B. HOWE, UNITED STATES NAVY, HEAD,
PASSIVE DEFENSE BRANCH, OFFICE OF CHIEF OF NAVAL
OPERATIONS**

Commander HOWE. Mr. Chairman and members of the committee: The Navy's protective construction policy includes the protective measures of dispersal, duplication, strengthening and underground construction. It is designed to protect personnel, equipment, and facilities against the effects of nuclear weapons. This policy, developed by the Joint Chiefs of Staff and coordinated by the Office of the Assistant Secretary of Defense, Properties and Installations, is aimed at increasing the survival probability of weapons systems essential for the conduct of combat missions.

The Navy does not have a shelter program, per se. Shelters are provided only to those personnel essential to the operation of highly classified essential facilities in the same manner as protection is afforded to the equipment and facilities these personnel operate.

The Bureau of Yards and Docks has overall technical cognizance of protective construction, including shelter design and actual construction. Design projects and studies are performed by the Bureau of Yards and Docks and its Naval Civil Engineering Research and Evaluation Laboratory, and also for BuDocks by the Naval Research Laboratory, the Naval Radiological Defense Laboratory, and private engineering firms.

The Navy feels that the state of the art of shelter design is well developed. Continuing emphasis is being put on lowering the cost of shelters and other protective construction.

A variety of studies on shelters and other protective construction measures have been sponsored and conducted by the Navy. One of these studies completed in 1956 was for the purpose of determining the total protective construction requirements of the naval shore establishment. This completed study is in fact the Navy's long-range plan for protective construction.

The Navy intends to pursue this plan.

Individual protective construction items will be considered in the annual military construction program in accordance with the priorities assigned.

These projects will, of course, compete with other military construction projects for the funds available.

I purposely kept my statement short because my supporting witness, Commander H. L. Murphy, has the details which I think you would like to hear concerning the shelters tested.

Mr. HOLFIELD. All right, we will proceed to his statement. Commander Murphy.

**STATEMENT OF COMDR. H. L. MURPHY, CIVIL ENGINEER CORPS,
UNITED STATES NAVAL RESERVE, DIRECTOR, PASSIVE DEFENSE
DIVISION, BUREAU OF YARDS AND DOCKS**

Commander MURPHY. Chairman Holifield and members of the subcommittee: It is my purpose to supplement the Navy general statement with additional data, requested by this subcommittee, dealing with engineering and related technical matters.

Specifically, such data include discussion of two Navy Bureau of Yards and Docks-sponsored structures (shelter) projects in the 1957 Plumbbob tests in Nevada, and a summary of selected studies performed by or for the Bureau of Yards and Docks bearing upon the problems of shelter against nuclear weapons effects.

Because it was written for informative purposes similar to the aims of this statement, an article being published in the forthcoming issue of the BuDocks Technical Digest is incorporated herein and will be amplified by additional data and figures.

In a continuing search over many years, the Bureau has considered many structures offering promise of low-cost shelter against atomic, biological, or chemical warfare attack. This search has turned up excellent shelters constructed or precast thin-shell concrete sections (bolted into dome or gable structure), or of corrugated steel plates (circular arch structure).¹ The latter, commonly known as an ammunition magazine and manufactured as a stock item by several firms, has been detailed with or without earth cover, including several cover configurations. The significant change over earlier versions is that the earth cover is now extended horizontally to a plane through the structure base at approximately 45 degrees, then sloped to natural grade (Figure 2 is for balanced cut-and-fill), thus reducing the sensitivity of the arch structure to the (asymmetric) blast drag (wind) loading.² Figures 1 and 2 show the latest concepts of this buried shelter tested both with and without the steel ribs indicated.

More recently, consideration has also been given to use of standard sewer conduits and cattle-pass sections for shelter, the concept involving 2 to 4 parallel "runs" (50 to 200 feet long) connected by a crosshead structure with entrance-way(s), decontamination spaces and equipment. Figure 3 depicts the test configuration used for evaluating the conduits only.

With careful construction techniques, in dry cohesive soils, 1957 tests³ using kiloton-range weapons showed no significant deformation of the corrugated metal shelters and conduits, shown herewith, under the following approximate blast peak overpressures: Corrugated metal arch shelter, without ribs—50 to 60 psi; with ribs—90 to 100 psi; reinforced concrete sewer and circular corrugated metal pipes—130 to 140 psi; corrugated metal cattle-pass—150 to 160 psi.

It is highly probably that all of these structures would satisfactorily withstand much higher peak overpressures, for example, conduits to 200 psi or more, whether from kiloton or megaton range weapons. Various soil types could, of course, modify these structural resistance values. Protection against all comparable initial and residual (fallout) radiation effects is incorporated by varying the thickness of earth cover and sandbagging details.

Detailed discussion of protective shelters¹ is inappropriate here; however, a few comments to augment the figures may be of interest. Conduits tested were 8 ft. precast concrete sewer (ASTM C75-55) and 8 ft. corrugated steel plate (10 gage) pipes, and corrugated steel plate (10 gage) cattle-pass 7'8" x 5'10".

In figure 2, the plan is varied to suit use—mass shelter, operating center, sickbay—and whether to be a pressurized, nonmask shelter or one requiring individual protective masks. Entrance details are also varied; others might include a steep, narrow-tread, shipboard-type "ladder" in a slightly larger conduit and hatch, or one similar to that of the standard FCDA (100 pounds per square inch) industrial shelter, figure 4. A trapdoor-and-sand emergency exit should be provided at the other end. Vents should include blast closures—possibly sliding steel door in the concrete "box" or high-pressure valve in the 8-inch, extra-heavy steel pipe—closed manually, or automatically by light, thermal or blast from the explosion. Floor should not be tied to the foundation, to allow the structure to "punch" downward slightly with the blast. Concrete shield walls could be used in lieu of sandbags, but the latter are easier to remove and replace, if necessary for equipment movement.

The "ribs" referred to in the article in connection with the modified ammunition magazine are 6-inch I-beams weighing 12½ pounds per linear foot (6I12.5). It should be made clear that the ammo magazine

¹ NavDocks TP-PL-8, Personnel Protective Shelters, June 1953 (under revision).

² The Effects of Nuclear Weapons (GPO), sec. 6.13.

³ Classified reports by Lt. (jg.) G. H. Albright, CEC, USNR.

shelter shown is complete when erected without such "ribs," due to the corrugations running circumferentially.

In contrast the so-called quonset-type structure is essentially a ribbed structure with a lighter gage corrugated metal covering. In fact, the ammo magazine corrugated steel plates in the arch are *not* in contact with the "ribs" as erected; contact is made only after the structure receives a very heavy load causing general deflection in the arch.

The ammo magazine shelter version without ribs was used by the Naval Radiological Defense Laboratory in their Plumbbob (1957) radiological shelter test which was discussed by Dr. Paul Tompkins in earlier testimony before this subcommittee. The earth cover and the entrance detail were, of course, differently designed due to the comparatively low blast pressures expected and received. This design version without ribs has been in BuDocks publications for several years, as is indicated by the article. The significant advance through 1957 tests has been in what we have learned about earth cover configurations.

Sheets 1, 2, and 3 provide supplementary sketches and data to those provided by the article. Sheet 1 includes technical details on the corrugated steel plates. Sheet 2 provides further information on the conduits. Sheet 3 shows one concept for using the pipe conduits in a large personnel shelter.

The plan shown in figure 2 includes biological and chemical warfare protection. Capacity might be 30 to 80 persons, depending on use, whether for one or both sexes, and the quantity of supplies to be stored inside the shelter. The "30" figure might be valid for such working spaces as control or communications centers. The "80" figure is considered approximately correct as an upper figure for personnel shelter and is based on approximately 10 square feet per person, a figure already cited several times to the subcommittee.

An engineering estimate of cost, prepared by BuDocks personnel in 1957, for construction of the ammo magazine shelter shown in figures 1 and 2, totaled \$26,000 excluding land and any operating equipment and supplies, as well as emergency power and potable-water tanks. This estimate was for construction in the Norfolk, Va., area, but the estimate can be related to various areas in the world through use of our published cost index.

Table I shows the aforementioned blast peak overpressures related to distances from ground zero for contact surface burst of several weapon yields; the latest known unclassified graph of pressure-distance data—reprint of talk on October 16, 1957, at A. S. C. E. annual meeting, New York City, by Capt. Ferd E. Anderson, Jr., Corps of Engineers, U. S. Army, Blast Division, AFSWP—has been used.

TABLE I

Peak overpressure (pounds per square inch)	Distance (feet)			
	20 kilotons	40 kilotons	1 megaton	20 megatons
200	670	845	2,460	6,680
160	725	915	2,670	7,250
140	775	975	2,850	7,750
100	895	1,130	3,300	8,950
60	1,115	1,405	4,110	11,150

Concerning the matter of selected studies performed by or for the Bureau of Yards and Docks and bearing upon the problems of shelter against nuclear weapon effects:

The bulk of information in this area is embodied in table II. We have excluded studies such as radiological decontamination and that sort of thing as not bearing on shelter. I should point out also that many of these projects are jointly supported, with 2, 3, or 4 agencies chipping in.

In summary, these investigations include such things as design of entranceways, air filtration systems, roof washdown systems, and investigation of the response of structures and structural elements to atomic blast effects. Some other items include a current engineering design and prototype fabrication contract (\$41,385) for a blast-closure device capable of withstanding at least 50 pounds per square inch blast peak overpressure. The design stage is about 95 percent completed.

Another item is a study of the potentialities of monolithic reinforced concrete shear wall structures, one-story initially, for resisting atomic blast effects. Study is by DuDocks structural engineers, utilizes electronic computer facilities to handle the large number of repetitive calculations involved, and is nearing completion. This study has been extended to arches and domes; this phase is approximately 50 percent completed.

I would like to insert a comment on duplication, if I may, sir. Duplication is unavoidable, but I think it is largely avoided in these areas through the many interagency committees that we have, through the very detailed and searching budget procedures that we must go through, and through formal and informal liaison.

As an example of a related matter outside of the Government, the American Society of Civil Engineers has a committee on structural dynamics that is preparing a Manual of Engineering Practice to be entitled "Design of Protective Structures To Resist Nuclear Weapons Effects."

While the membership of that committee is chosen on the basis of individual members of the society, it so happens—I feel sure by prearrangement more than accident—that all of the agencies concerned with this field and the college professor types that are specialists in the field, are on this committee; and the committee manual, aimed at enlarging the capability of consulting engineers in this country to design protective structures, will represent the benefit of studies undertaken by all these different agencies. These include specifically my own Bureau, the Army Engineers, AFSWP, FCDA, and on down the line.

Technical data and information developed by the Bureau of Yards and Docks to meet its responsibilities to the Navy are published in early stages in the BuDocks Technical Digest, later in formal technical publications and other directives such as instructions and notices.

The Technical Digest goes to all Civil Engineer Corps officers, to most activities of the Navy Shore Establishment, to more than 150 repository libraries, and to selected addressees.

The Technical Publications are distributed to specific lists to meet user requirements and are available on request by libraries, public bodies, Government contractors, and so forth.

The Technical Digest and those technical publications of mutual concern are routinely furnished to the Federal Civil Defense Administration, which reciprocates by furnishing copies of all FCDA publications to the Bureau.

I might say that, finally, the Bureau has adopted and distributed one or more publications, for our own use, of the Army Engineers, Federal Civil Defense Administration, Atomic Energy Commission, and so on.

That completes my prepared statement, Mr. Chairman.

(The tables and figures referred to in the prepared statement by Commander Murphy are as follows:)

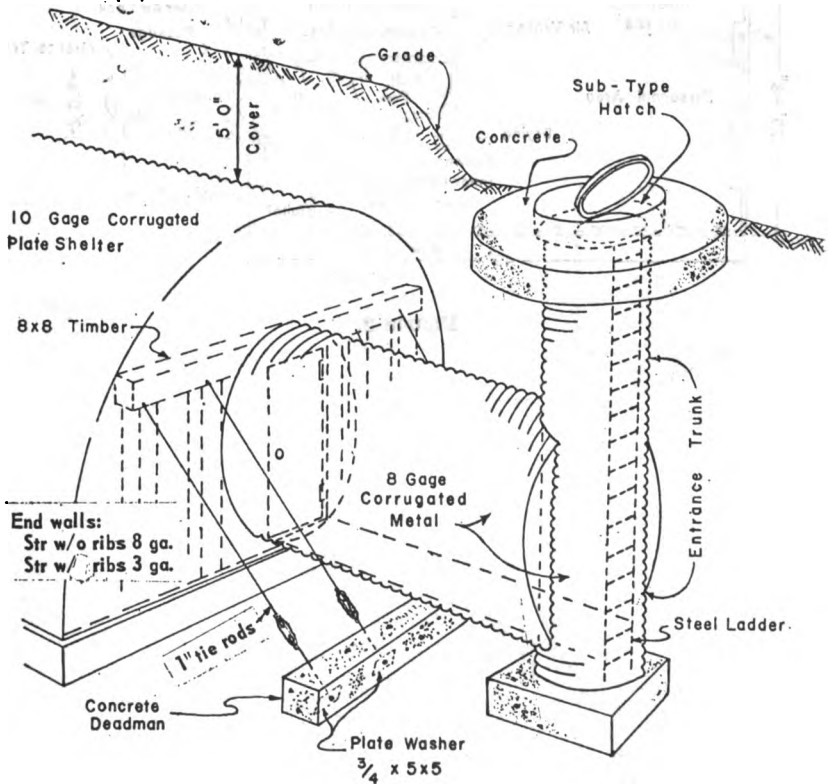


FIGURE 1.

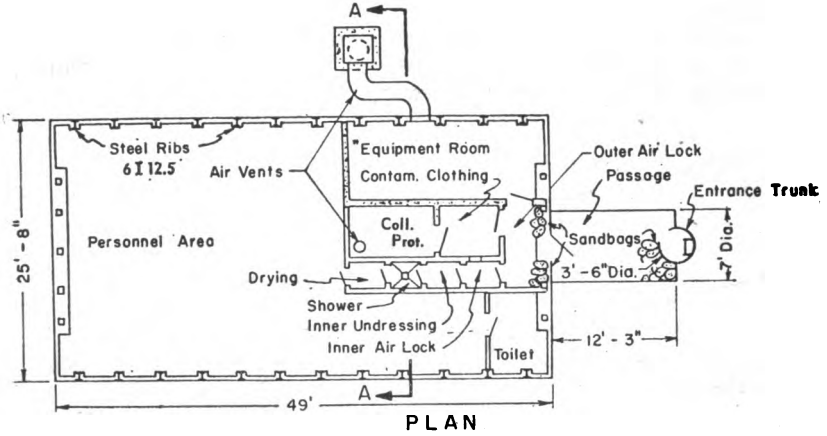
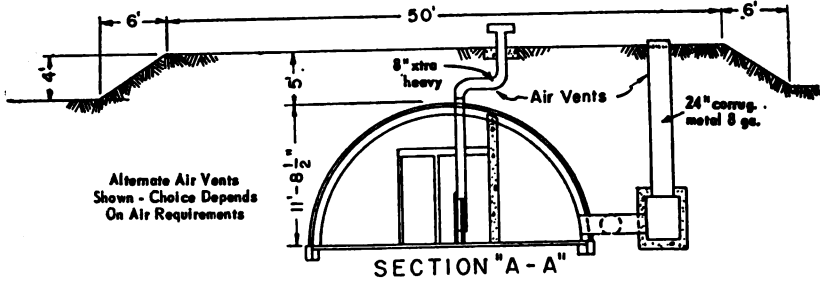


FIGURE 2.

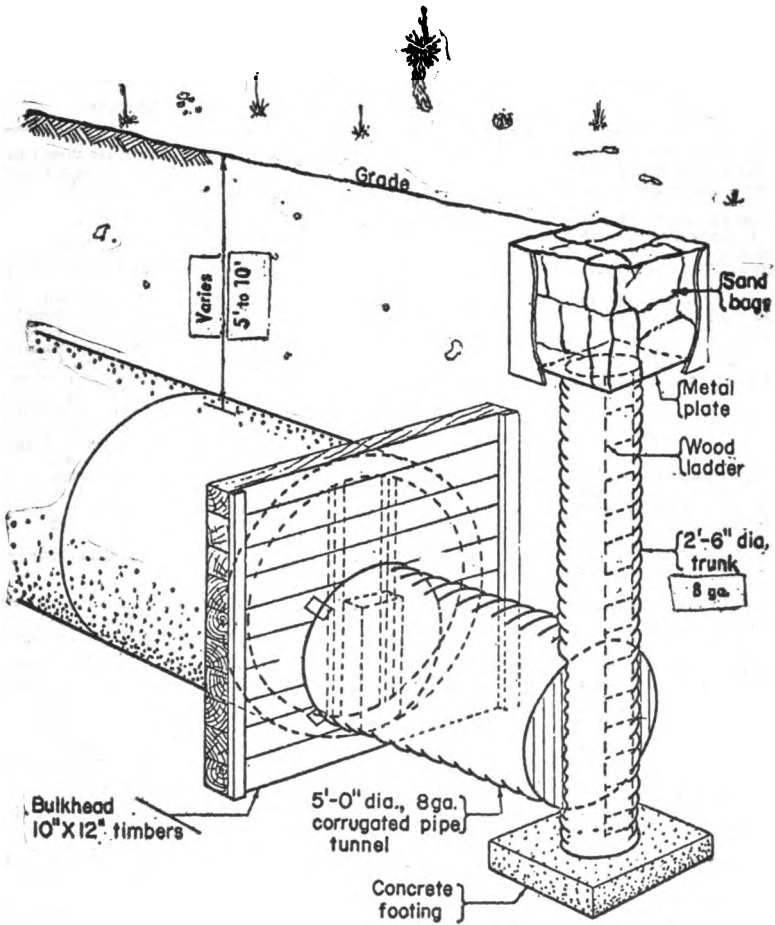


FIGURE 3

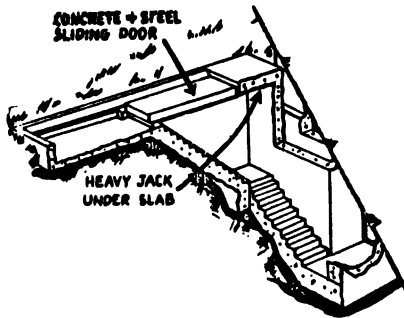


FIGURE 4.

TABLE II.—Bureau of Yards and Docks—Selected atomic warfare defense research projects #

Title	By	55*	56	57	58	Remarks
Test and evaluate typical commercial air filters and mechanical air systems.	B	3	1	1	-----	Continuing study; has shown to date that commercial filters are useful as prefilters for BW-CW collective protectors.
Continuous protection against B & R aerosols and chemical agents.	O	10	-----	-----	1	Final report due shortly.
Fire protective coatings-----	B & D	-----	8	5	30	Preliminary formulations show promise.
Protective coatings to aid in radiological decontamination.	E	-----	15	-----	-----	Scientific work completed. Final report will indicate applicability of protective coatings on various surfaces to increase speed/effectiveness of radiological decontamination.
Roof washdown systems-----	E	-----	-----	6	15	Feasibility study completed; indicates such systems are feasible, and applicable to Navy Shore Establishment. Continued work planned towards development of such systems; preliminary phase underway.
Operation Upshot-Knothole-- Three dimensional model study of BuDocks test structures.	A F	(1) (1)	-----	-----	-----	Completed atomic test operation (1953). Obtained blast loading data for several BuDocks structures in Operations Greenhouse (1951) and Upshot-Knothole (1953).
Studies of the effects of earth cover on structural response.	G	17	-----	-----	-----	Completed. Data used in later project.
Operation Teapot Project 3.6 (1955).	G	(1)	-----	-----	-----	Evaluated protection afforded by earth cover on modified ammo magazine shelter; results used in Operation PLUMBBOB (1957).
Operation Plumbbob (1957)-- Advanced planning for atomic test operations.	A & B B	-----	-----	(1)	20	Completed atomic test operation. Planning for BuDocks participation in future atomic test operations.
Emergency shelters-----	D	80	-----	-----	-----	Concerns hasty-type shelter. Final report due.
Blast closure device for shelter Radiation shielding, structures and shelters.	C H	-----	35	-----	25	Completed. 600 cfm device developed. Data on shielding from fallout by standard barracks provided.
Concrete personnel shelters--	B	-----	-----	-----	10	Work barely started.
Fundamental studies of gamma and neutron shielding properties of shelters.	I & J	-----	-----	45	15	Studying earth and concrete. Incomplete.
Studies on fire protection of naval shore installations in atomic warfare.	K	-----	-----	40	-----	Final report covers thermal vulnerability and protection for such installations.
Technical studies in atomic defense engineering.	B	-----	-----	-----	35	Continuing study of protective design and construction problems.

1 AFSPW funds.

(#) concerning shelter, including BW-CW projects having related AW applications.

(*) Funds in thousands of dollars by fiscal years appropriated; fiscal year 1955 includes earlier years.

A—Bureau of Yards and Docks, Department of the Navy, Washington 25, D. C.

B—U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif.

C—Chemical Warfare Laboratories, Army Chemical Center, Md.

D—Engineer Research and Development Laboratories, Fort Belvoir, Va.

E—U. S. Naval Radiological Defense Laboratory, San Francisco, Calif.

F—Ballistics Research Laboratories, Aberdeen, Md.

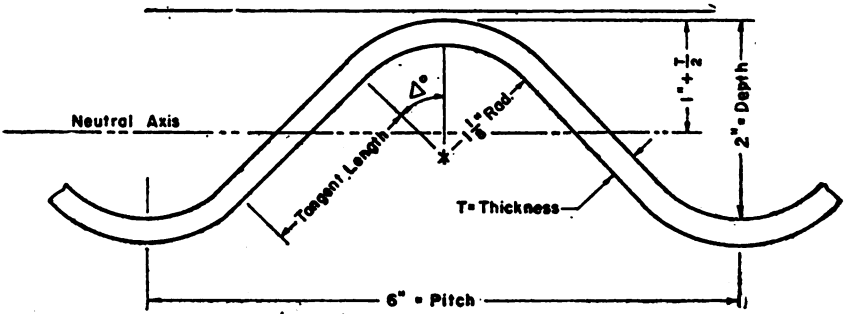
G—Stanford Research Institute, Stanford, Calif.

H—U. S. Naval Research Laboratory, Washington 25, D. C.

I—Associated Nucleonics, Inc. (formerly Walter Kilde Nuclear Laboratories), Garden City, Long Island, N. Y.

J—National Bureau of Standards, Washington 25, D. C.

K—Armour Research Foundation of the Illinois Institute of Technology, Chicago, Ill.

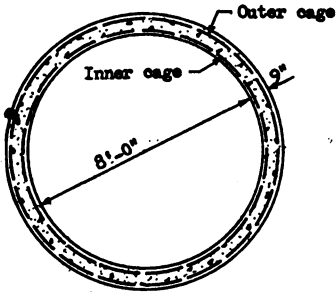


Properties	3 Gage	8 Gage	10 Gage
Thickness T (inch)	0.2451	0.1644	0.1345
Tangent Length (inch)	1.7377	1.8283	1.8606
Angle Δ°	45° 47'	45° 00'	44° 44'
Moment of Inertia (in ⁴)*	1.756	1.153	0.937
Area of Section (in ²)*	3.658	2.449	2.003
Section Modulus (in ³)*	1.564	1.066	0.878
Radius of Gyration (inch)	0.693	0.686	0.634

* Per foot of horizontal Projection

PROPERTIES OF CORRUGATED STEEL PLATES

SHEET 1.

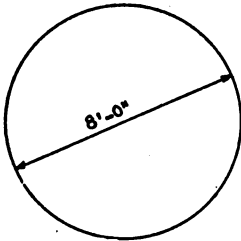


PRE - CAST CONCRETE
SEWER PIPE

Section lengths - 5'-0"

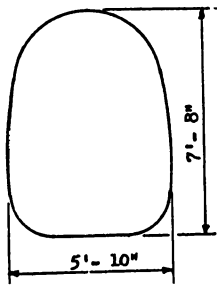
Concrete Str^g - 3,000 psi

Steel Area - 2 lines totaling 0.57
sq. in./lin.ft. (inner
cage 3/8" @ 4" o-c; outer
cage 5/16" @ 3-3/4" o-c;
cage reinf. circumferential
and 1" from respective
surface; longitudinal
reinf. sufficient to keep
cages in shape. ASTM C75-55).



CORRUGATED STEEL

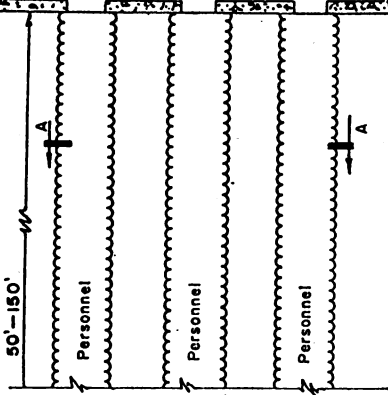
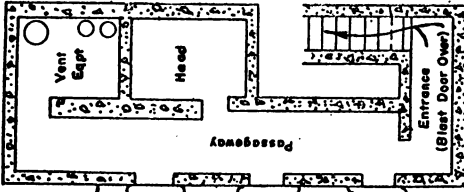
Corrugated Steel - 10 gage



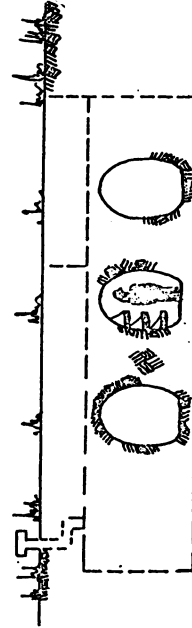
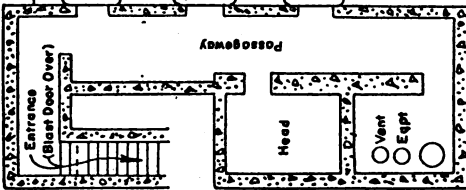
CATTLE - PASS
CORRUGATED STEEL

Corrugated Steel - 10 gage

SHEET 2.



Plan



Section A A

SHEET 3.

Mr. HOLIFIELD. Thank you, sir. This table II that you have on page 9: What does this represent, Commander?

Commander MURPHY. As I stated in the statement, sir, this is intended to be the bulk of information we are pursuing and is in response to your request for selected studies bearing upon the problems of shelter against nuclear weapons effects. We have omitted such things as, I said, decontamination techniques and that sort of thing. These bear more directly on shelter.

You may note that we have a large number of agencies, Government and private, that perform the work for us; and as I said, many of these are jointly with other defense agencies, two or more agencies involved.

Mr. HOLIFIELD. Such as those listed at the bottom of the page?

Commander MURPHY. Yes, sir. I haven't listed, sir, the agencies where we are jointly supporting it. These are the agencies doing the work. That has been my intention.

Mr. HOLIFIELD. May I refer to page 8 of your statement where you used the figure \$41,385. Will you elaborate on exactly what that means?

Commander MURPHY. Yes, sir. This is the cost of this engineering design and prototype fabrication contract, sir, wherein we have a qualified firm designing and fabricating an actual prototype of a blast closure device that will withstand at least 50 pounds per square inch blast peak overpressure and that will handle air quantities of approximately 5,000 cubic feet per minute without undue resistance to airflow.

Mr. HOLIFIELD. This is in bringing air into a shelter?

Commander MURPHY. Yes, sir; or exhausting it. In other words, it is to close your airports, you might say, in the event of an attack. As we hope it will be finally designed, it will be operable either manually or by the light or heat of the detonation itself.

This is a piece of hardware—I might characterize it, Mr. Chairman—that does not exist. There are other blast closure devices in existence for other quantities of air, but none in this area. We felt a need for it. The fruits of the contract will be widely disseminated to those interested, and particularly include the Federal Civil Defense Administration.

Mr. HOLIFIELD. This seems to me a practical, justifiable approach to some of the practical programs. I think it may indicate that, with a very small expenditure of money, you can develop something that will have great practical application in the case that a shelter program is developed.

Commander MURPHY. We hope so, sir. Our quantities of money which we spend on this are small, and we have to attempt to get every bit of return that we can.

Mr. HOLIFIELD. You say that is about 95 percent completed?

Commander MURPHY. Yes, sir. I can be more precise. We have made a preliminary review of the design effort and have it back to the contractor to use those preliminary review comments. It will then come to us for final review and acceptance of the design stage, at which point he will go ahead with fabricating the actual piece of hardware for us.

Mr. HOLIFIELD. Would it be permissible for one of the members of the staff, Mr. Brewer, to look at these drawings and go over this with you at this stage of the operation?

Commander MURPHY. I expect the design stage to be completed, sir, very soon. I would say within a month. I think at that point it would be very appropriate for him to do so.

Right now they are in the stage of incorporating our preliminary comments, sir.

Mr. HOLIFIELD. Then you will make available to us this information as soon as it is completed?

Commander MURPHY. Yes, sir.

Mr. HOLIFIELD. I noticed your cost there of \$26,000—that would be on the basis of 80 people, giving them 10 square feet. It would be a little over \$300; wouldn't it?

Commander MURPHY. Yes, sir. I must emphasize that we have biological and chemical warfare protection in there, which soaks up a bit more of the usable space. For the same area, others might insist that there was a capacity there of 100 or more. We think 80 is a more useful and adoptable figure, particularly if any reasonable stay time is contemplated—beyond a few hours, let's say.

Mr. HOLIFIELD. How much would you estimate the chemical warfare and biological warfare element has added to that?

Commander MURPHY. I would say perhaps \$3,000, Mr. Chairman. But I could pinpoint that a little more accurately at such time as I review the transcript, if you like, sir.

(Later corrected estimate approximately \$1,300, rather than \$3,000.)

Mr. HOLIFIELD. I wish you would.

Commander MURPHY. Yes, sir. Some of these things, Mr. Chairman, are not exactly exclusive. That is, the air-flow requirements we may need for biological and chemical equipment to provide forced ventilation would be much the same as for the shelter without—

Mr. HOLIFIELD. The radioactive debris?

Commander MURPHY. Simply to introduce air. If we were only treating radioactive debris, we may then use a simpler filter than the chemical and biological warfare filter. So the savings that appear at first blush do not always materialize.

I would like, also, to comment on this business of estimating. Underground shelters involve excavation and replacement of earth, or you may have to bring in fill on waterfront land, in encountering a high-ground water table. These costs are the things that vary all over the lot in construction terms. The shelter itself is a standard item. We can price that very readily. But to attempt to price excavation costs and earth-moving costs generally, and the cost of putting the soil back and perhaps introducing some better soil constituents to improve your soil situation—these things are the things that give you trouble in coming up with an estimate of a shelter that is essentially an underground shelter.

This can be covered, of course, but your most economical is the approximate thing that we have shown here in the figures, and that is balancing the cut and fill, because you have no earth to bring in or dispose of.

Mr. HOLIFIELD. In the case of a high-water level where this building would have to be mainly aboveground, and yet you would have to

cover it with earth which was brought in, would you lose quite a bit of your blast protection?

Commander MURPHY. If I may put it this way, in order to get the protection, to exploit fully the protection capability of this arch-type structure, we have found that we must cover it and extend the earth cover out far enough so that the arch is no longer sensitive to the drag phase of the blast loading—that is, the wind phase.

If it were a question of bringing in all of your cover, we would be faced with two alternatives, as I see it: One, not using this type of structure at all—that is, using a rectangular structure perhaps, rather than an arch type. Or, if we stuck to the arch type, placing those in battery and covering them, and then extending the earth cover out from the furthestmost one.

This second alternative would cut down the total quantity of earth involved. At the same time it would deflect the blast wave sufficiently so that when it got to the arches themselves, the interior ones or the outside ones, the loading would be then essentially a symmetrical loading, and the arch is very good for this.

Mr. HOLIFIELD. In your opinion this would be cheaper construction than an arch concrete?

Commander MURPHY. No, sir; I couldn't answer that question in the affirmative. These standard designs are useful things to have on the shelf, but each engineering situation must be evaluated on its own terms. Perhaps the availability of materials in the given area may be a factor—steel might be cheaper than concrete or vice versa. Perhaps your crafts that are available to do certain work are limited—each situation can be a cost factor.

You might have a local situation where the labor costs were higher or lower, and maybe the availability of the workmen themselves is limited.

Standard designs are useful things, but they are by no means a complete answer to every situation, sir.

Mr. HOLIFIELD. They give you a guide rule to go by.

Commander MURPHY. Yes, sir.

Mr. HOLIFIELD. Any questions?

Mr. RIEHLMAN. No.

Mr. HOLIFIELD. Any questions?

Mr. ROBACK. No.

Mr. HOLIFIELD. Thank you very much, Commander. That gives us some specific information which we are glad to have.

Do you have another witness this morning, Mr. Facci?

Mr. FACCI. Yes, sir; Colonel Prickett of the Air Force.

Mr. HOLIFIELD. All right, Colonel Prickett, will you please come forward?

STATEMENT OF COL. DONALD I. PRICKETT, UNITED STATES AIR FORCE, DIRECTORATE OF RESEARCH AND DEVELOPMENT, GUIDANCE AND WEAPONS DIVISION; ACCOMPANIED BY R. G. TUTTLE, ASSISTANT OPERATIONS ANALYSIS; AND S. L. ELY, DIRECTORATE OF INSTALLATIONS

Colonel PRICKETT. Yes, sir.

Mr. Chairman and members of the committee, the Air Force appreciates the opportunity to answer the questions forwarded to the Secretary of the Air Force by your letter of November 26.

I am assigned within the Directorate of Research and Development, Deputy Chief of Staff, Development.

I am the responsible action officer for the Air Force Research and Development program concerned with Nuclear Weapons Development, Effects and Application.

I have been appointed chief spokesman for the Air Force. However, I have with me Mr. Tuttle from Assistant Operations Analysis and Mr. Ely from the Directorate of Installations. Both directorates are within Deputy Chief of Staff, Operations. They will assist in answering your oral queries relative to the questions passed to the Air Force by this committee.

With your permission, I will read and answer each question in the sequence they were asked. This statement is unclassified.

Question No. 1: What studies have been or are being sponsored by the Department, by contract or otherwise, which bear upon the providing of shelters against nuclear weapons effects for military personnel or facilities?

Answer: To put our past and present program in proper perspective, I will trace the progress and objectives since 1951 when our organized effort in this area could first be called a program.

During the period 1951 to 1955 our main objective was to determine response of structures in a typical target complex which might be subject to the weapon effects, primary blast, from the nominal yield ranges of weapons. This information was needed for target planning as well as defense planning.

We established within ARDC a research group and a project now known as project 1080, title: Blast Effects on Buildings and Structures. The work under this project—and this is important, Mr. Chairman—was to conduct theoretical studies as well as analyses and any necessary full-scale testing.

The general philosophy of this research was to provide basic data on behavior and response of generalized structural types such as light and heavy steel frame structures, bridges, urban area buildings and so on.

This basic information was then applied by ARDC and Intelligence to arrive at a damage assessment document for across the board evaluation of target complexes. The program both then and now divides administratively and fundingwise into two parts.

First, the theoretical and analytical program which supports, generates requirements for, and evaluates the full-scale atomic-test data. This part was accomplished by ARDC in-house effort and by contractors. Attachment (A) is a list of pertinent reports concerned with the Air Force theoretical and analytical program. If I might say here, I would like also to make a statement on this duplication. Because Air Force has never really been in the engineer business of structures like BuDocks and the Engineers, we have had to justify this program very strongly—in other words, often we have to go up to the DOD and explain the titles to our different projects so that they understand exactly what we are doing to be sure it isn't duplication.

I have had to do this several times, and I know that they keep a close tab on this particular area. It is very difficult just from the title of a report, sir, to really tell whether it is or not duplication.

This is why we have to explain the projects. We also have other methods. One, which took place last December, was a symposium

which was held within ARDC. It was at the request of the Department of Defense to get all of the Navy, Army, and Air Force people and the DOD people together to look at this structures program again to be sure we weren't duplicating in areas where we could double up or have somebody else do our work.

This is one mechanism to avoid duplication in this structures program in the services.

Another one is that we have a blast panel of consultants of which Dr. Newmark is one. We hold that panel meeting at least once a year within the Air Force, we invite the other services and they always send their representatives. In this program our past work and future work is always discussed and any areas that somebody else is doing, we try to avoid. Once in a while, on the basis of a pure technical difference of opinion, you may find people going down two different roads, until they are far enough down the road that we can determine who is going the right road.

In some instances this can happen, and it does happen with our knowledge because sometimes we just disagree with the other fellow.

I might point out, sir, that the DOD mechanism of coordination is through a project card that we have to submit on our research and development projects for funding review. They do not approve funds until they are satisfied themselves that somebody else isn't doing the same thing. If they are, they point it out to us.

The other part of our program was the atomic-test work which was accomplished by the Air Force or for the Air Force within the Armed Forces Special Weapons Project program. A list of the pertinent reports under this phase is shown in attachment (B).

Where I have listed, sir, the contractors—and you will see AFSWP off to the side—this means the project was in the program put together for the atomic test through the management of AFSWP.

During the 1951 to 1955 period we relied primarily on Army and Navy, AFSWP and FCDA for our information on ground level thermal effects and fallout data. The impact of the TN weapon and damage radii possible, even with large CEP's, plus the fact we were in fair shape on target damage estimates for small weapons, led us to reorient our research and development program.

Concurrent with completion of war gaming studies we reoriented the program in 1955 to emphasize the collection of basic data which would be used by the designer for above or below ground hardened structures in moderate to high overpressures, i. e., 25 to 200 pounds per square inch or even higher.

Here, sir, is where we got almost into another area. We were going one step above where we were working on damage assessment. You are almost into a new area as far as environment.

A secondary objective was the use of this basic data for target studies involving hardened targets. The new program was primarily concerned with ground shock, both air and ground induced, response of beams, arches, domes, slabs, et cetera, under dynamic loads. A related program was, of course, to establish the effects environment from large yield weapons. Armed Forces Special Weapons Project's program in field tests provide these effects data.

Because close-in fallout and prompt radiation now assumed considerable significance when operating from hardened sites, we placed

more emphasis on this aspect. This included studies of both shielding of operating crews and equipment as well as decontamination and debris removal. We established what is known now as project 7806 to provide these inputs.

As Dr. Harris of LASL stated in his testimony, the investigations of shielding against prompt neutrons in the high level pounds-per-square-inch region is hampered by lack of source strength and spectrum data. We can, however, make some fair approximations.

In the field of decontamination of areas surrounding say a hardened missile or aircraft structure, we have considered wash down and sweeper systems and are now testing a shielded cab vacuum sweeper—originally designed to keep the runways and ramps free of nuts, bolts, and other small debris.

The Navy and Army programs relative to fallout and decontamination techniques has provided a good deal of the technical data in this area to date. Attachment (C) lists pertinent reports of the work we have accomplished in this area under analytical and theoretical programs. The problem of fallout protection for military personnel will be covered in more detail in the answer to the second question asked by this committee.

The program described in general so far brings us up to the present date. Our fiscal year 1959 program is to concentrate in those areas which data are still the most uncertain, such as ground motion studies and neutron source strength as well as shielding.

This program is reflected in our fiscal year 1959 research and development budget estimates and proposed future test program now in the process of approval by Department of Defense.

With respect to the state of the art in design, we agree and support Dr. Newmark's statement that we can harden designs for systems or personnel up to at least 100 p. s. i. regions with some confidence, but we believe a continued R & D program will buy us more protection for the same dollar or the same protection for less dollars. If our planned program through 1960 can be carried out, I believe we will approach the point of diminishing returns for our R & D effort.

One part of this program which is of possible interest is our first attempt at a design handbook for application of basic structural loading and response data to Air Force missile systems. We anticipate this will enable the design engineer to design the most resistant structure within the state of the art for the money available.

Concurrent with the R & D program to obtain basic data, we have carried on feasibility studies wherein we balance dispersal, mobility, hardening, threat, and survival, to arrive at operational requirements. We have also conducted preliminary design studies to evaluate cost versus survival, survival versus degree of hardening, and all the parameters which influence decisions on requirements.

Question No. 2: The second question asked by this committee was:

What plans are in being or in prospect to provide shelters against nuclear weapons' effects for military personnel, equipment and facilities?

Answer: I will break this answer into two distinct areas: (a) That which pertains to weapons systems or vital communication centers; (b) That which applies to fallout protection of military personnel in general.

First then plans or accomplishments with respect to weapon systems or communication centers. We have built or have in design stage about 5 or 6 vital communication centers which will supposedly stand moderate overpressures and the associated radiation environment. At some overseas sites we have provided for low to moderate level of protection to critical fuel supplies and storage facilities.

About 1 year ago a special group within the air staff was formed to consolidate and evaluate the numerous studies concerned with survival of the certain systems under development. Base hardening was one consideration.

This group has recommended some hardening for weapon systems. In at least one case designs are nearing completion for protection to the order of 100 p. s. i. environment and preliminary designs have been completed for other cases. The designs are not particularly applicable to personnel shelters except that they do provide for protection of the immediate operating crews as part of the weapon systems.

One consideration to bear in mind concerning protecting weapon systems is that systems, unless specifically designed, cannot withstand the accelerations resulting from the ground shock or blast overpressure as well as humans.

Because of weapon systems and components sensitivity to these effects, the structure and system now have to be considered together. The shelter design ideally must be considered as a part of the weapon system itself. Protection for operating crews is almost automatic.

There is one point which should be considered, when looking at costs of shelters for weapon systems and perhaps extrapolating or comparing these with personnel shelters. The operational problems such as large spans, massive doors, quick reaction time and operations in a radiation environment run the costs up considerably for a given level of protection as compared to personnel shelters. So while basic data can be applied, system shelter designs are not necessarily the best for personnel application.

With respect to plans for protection of personnel aside from those directly concerned with operating systems or vital communications centers, any immediate plans are concerned with fallout shelters. The concept is to provide for sheltering of the personnel necessary to keep bases operational in a radiation environment. For example, Air Defense bases which would experience downwind fallout.

We would evacuate noncritical personnel, if possible, and attempt to shelter those individuals necessary to rearm and refuel interceptors. In this respect we have leaned heavily on the Army field-shelter concept because their R & D program relative to troop protection seemed most applicable.

ARDC sometime ago sent briefing teams to all commands instructing them on simple techniques for the shelter program—such as sand-bagging inside hangars, root-cellar-type earth shelters, use of basements, et cetera.

AF Manual 355-12 provides guidance in this subject. Each base commander is responsible for instituting simple shelter programs within resources available to meet his requirements. One word I might mention on that, sir, you will find at a base today this shelter program will vary anywhere from just picking out the best available build-

ing for shelter to maybe sandbagging inside a hangar. It is strictly scratch up what you can. We give them the basic principles of protection and let them see what they can come up with.

We now include these shelter plans in our annual base inspection. Mr. Ely of the directorate of installations can give you more details on that aspect if you wish.

As far as protecting the military personnel who would not be directly engaged in combat operations, we have no immediate plans other than the normal use of basements or houses and perhaps evacuation. If we were to provide across the board protection, we in Research and Development would probably recommend the Army or Navy personnel shelter design.

Question No. 3: The third question asked by this Committee was:

What component units, services or activities are engaged, through contractors or otherwise, in atomic shelter design or construction work?

Answer: The Rand Corporation, Air Research and Development Command, Strategic Air Command, Tactical Air Command, Ballistic Missile Division and Air Installations, Headquarters, United States Air Force, and Air Defense Command are all engaged in preliminary design work—generally in support of establishing relative cost estimates for across-the-board look at survival problems.

Specific or final type designs have been accomplished by Ballistic Missile Division, by Air Installations through Office of the Chief Engineer, Strategic Air Command, and Tactical Air Command. Actual construction has been completed or is underway within Strategic Air Command, and in overseas areas.

This then covers a general statement of the Air Force program related to protective construction and shelters. I have not attempted to go into any technical details. Mr. Ely, Mr. Tuttle, and myself can answer some questions in this respect.

Mr. HOLIFIELD. Thank you, Colonel.

Any question, Mr. Riehlman?

Mr. RIEHLMAN. No questions.

Mr. HOLIFIELD. Any questions?

Mr. ROBACK. What kind of studies does the Rand Corporation make? Are they technical studies, or are they policy studies?

Colonel PRICKETT. They are technical, sir, and sometimes war-gaming. They put together the statistics and come up with probabilities.

Mr. ROBACK. Are they exclusive contractors to the Air Force?

Colonel PRICKETT. Not exclusive, sir, they are free to do some work on their own. Part of the funding of their existence is Air Force. The other part, they rely on outside agencies.

Mr. HOLIFIELD. We are pushed for time because it is getting late—later than we expected. There are several questions that occur to me in this presentation, but I believe that because of the lack of time we will present them to you in the form of a letter, and we can add them to the answers which you have given us today.

Colonel PRICKETT. Yes, sir.

Mr. HOLIFIELD. Does this complete your witnesses?

Mr. FACCI. Yes, sir. These are all our witnesses.

Mr. HOLIFIELD. We want to thank you, sir, for coming and all of those on your staff who have participated and attended today.

We will have our staff confer with you in regard to the additional material which has been requested or which may be requested as a result of the things which you have presented.

Thank you very much.

The committee is adjourned.

(Whereupon, at 12:45 p. m. the committee was adjourned.)

CIVIL DEFENSE

Part II—Reorganization Plan No. 1 of 1958

TUESDAY, MAY 6, 1958

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met in room 1501-B, New House Office Building, pursuant to adjournment, at 10 a. m., Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield (presiding), Fascell, Griffiths, Riehlman, Lipscomb, and Minshall.

Also present: Herbert Roback, staff administrator; Carey Brewer, senior defense specialist; and Robert McElroy, investigator.

Mr. HOLIFIELD. The subcommittee will be in order.

The Chair has been presented with a letter from the Director of the Bureau of the Budget, Mr. Stans, as follows, under date of May 6.

MY DEAR CHAIRMAN HOLIFIELD: This is in reply to your letter of May 2, 1958, inviting representatives of this Bureau to appear before your subcommittee on May 6, 1958, to present testimony on civil defense policy and reorganization plan No. 1 of 1958.

Based upon conversations which representatives of this Bureau have had with you and members of your staff, I have arranged for Mr. William F. Finan, assistant director for management and organization, to represent the Bureau at the May 6 hearings. Mr. Finan will be prepared to testify only on reorganization plan No. 1 of 1958. With regard to the matter of civil defense policy, including the issue of shelters, we believe that the Federal Civil Defense Administrator would be the most appropriate witness to express executive branch views.

I wish to assure you that either myself or the Deputy Director of the Bureau will be pleased to appear before your subcommittee at a later date to discuss reorganization plan No. 1 of 1958 should the subcommittee desire it.

Sincerely yours,

MAURICE H. STANS, *Director.*

(The President's message and Reorganization Plan No. 1 of 1958 follow:)

[H. Doc. No. 375, 85th Cong., 2d sess.]

MESSAGE FROM THE PRESIDENT OF THE UNITED STATES, TRANSMITTING REORGANIZATION PLAN NO. 1 OF 1958, PROVIDING NEW ARRANGEMENTS FOR THE CONDUCT OF FEDERAL DEFENSE MOBILIZATION AND CIVIL DEFENSE FUNCTIONS

To the Congress of the United States:

I transmit herewith Reorganization Plan No. 1 of 1958, prepared in accordance with the Reorganization Act of 1949, as amended. The reorganization plan provides new arrangements for the conduct of Federal defense mobilization and civil defense functions.

In formulating Reorganization Plan No. 1, I have had the benefit of several studies made by the executive branch as well as those conducted by the Congress. The reorganization plan will overcome the major difficulties revealed by those studies and mentioned in my 1959 budget message where I made the following statement:

"The structure of Federal organization for the planning, coordination, and conduct of our nonmilitary defense programs has been reviewed, and I have concluded that the existing statutes assigning responsibilities for the central coordination and direction of these programs are out of date. The rapid technical advances of military science have led to a serious overlap among agencies carrying on these leadership and planning functions. Because the situation will continue to change and because these functions transcend the responsibility of any single department or agency, I have concluded that they should be vested in no one short of the President. I will make recommendations to the Congress on this subject."

The principal effects of the reorganization plan are—

First, it transfers to the President the functions vested by law in the Federal Civil Defense Administration and those so vested in the Office of Defense Mobilization. The result is to establish a single pattern with respect to the vesting of defense mobilization and civil defense functions. At the present time disparity exists in that civil defense functions are vested in the President only to a limited degree while a major part of the functions administered by the Office of Defense Mobilization are vested by law in the President and delegated by him to that Office. Under the plan, the broad program responsibilities for coordinating and conducting the interrelated defense mobilization and civil defense functions will be vested in the President for appropriate delegation as the rapidly changing character of the nonmilitary preparedness program warrants.

Second, the reorganization plan consolidates the Office of Defense Mobilization and the Federal Civil Defense Administration to form a new Office of Defense and Civilian Mobilization in the Executive Office of the President. I have concluded that, in many instances, the interests and activities of the Office of Defense Mobilization and the Federal Civil Defense Administration overlap to such a degree that it is not possible to work out a satisfactory division of those activities and interests between the two agencies. I have also concluded that a single civilian mobilization agency of appropriate stature and authority is needed and that such an agency will ensue from the consolidation and from the granting of suitable authority to that agency for directing and coordinating the preparedness activities of the Federal departments and agencies and for providing unified guidance and assistance to the State and local governments.

Third, the reorganization plan transfers the membership of the Director of the Office of Defense Mobilization on the National Security Council to the Director of the Office of Defense and Civilian Mobilization and also transfers the Civil Defense Advisory Council to the Office of Defense and Civilian Mobilization.

Initially, the Office of Defense and Civilian Mobilization will perform the civil defense and defense mobilization functions now performed by the Office of Defense Mobilization and the Federal Civil Defense Administration. One of its first tasks will be to advise me with respect to the actions to be taken to clarify and expand the roles of the Federal departments and agencies in carrying out nonmilitary defense preparedness functions. After such actions are taken, the direction and coordination of the civil defense and defense mobilization activities assigned to the departments and agencies will comprise a principal remaining responsibility of the Office of Defense and Civilian Mobilization.

After investigation, I have found and hereby declare that each reorganization included in Reorganization Plan No. 1 of 1958 is necessary to accomplish one or more of the purposes set forth in section 2 (a) of the Reorganization Act of 1949, as amended.

I have also found and hereby declare that it is necessary to include in the accompanying reorganization plan, by reason of reorganizations made thereby, provisions for the appointment and compensation of new officers specified in sections 2 and 3 of the plan. The rates of compensation fixed for these officers are, respectively, those which I have found to prevail in respect of comparable officers in the executive branch of the Government.

The taking effect of the reorganizations included in Reorganization Plan No. 1 of 1958 will immediately reduce the number of Federal agencies by 1 and, by providing sounder organizational arrangements for the administration of the affected functions, should promote the increased economy and effectiveness of the Federal expenditures concerned. It is, however, impracticable to itemize at this time the reduction of expenditures which it is probable will be brought about by such taking effect.

I urge that the Congress allow the reorganization plan to become effective.

DWIGHT D. EISENHOWER.

THE WHITE HOUSE, April 24, 1958.

REORGANIZATION PLAN No. 1 OF 1958

Prepared by the President and transmitted to the Senate and the House of Representatives in Congress assembled, April 24, 1958, pursuant to the provisions of the Reorganization Act of 1949, approved June 20, 1949, as amended

CIVILIAN MOBILIZATION

SECTION 1. *Transfer of functions to the President.*—(a) There are hereby transferred to the President of the United States all functions vested by law (including reorganization plan) in the following: The Office of Defense Mobilization, the Director of the Office of Defense Mobilization, the Federal Civil Defense Administration, and the Federal Civil Defense Administrator.

(b) The President may from time to time delegate any of the functions transferred to him by subsection (a) of this section to any officer, agency, or employee of the executive branch of the Government, and may authorize such officer, agency, or employee to redelegate any of such functions delegated to him.

SEC. 2. *Office of Defense and Civilian Mobilization.*—(a) Subject to the provisions of this reorganization plan, the Office of Defense Mobilization and the Federal Civil Defense Administration are hereby consolidated to form a new agency in the Executive Office of the President which shall be known as the Office of Defense and Civilian Mobilization, hereinafter referred to as the "Office."

(b) There shall be at the head of the Office a Director of the Office of Defense and Civilian Mobilization, who shall be appointed by the President by and with the advice and consent of the Senate and shall receive compensation at the rate now or hereafter prescribed by law for the heads of executive departments.

(c) There shall be in the Office a Deputy Director of the Office of Defense and Civilian Mobilization, who shall be appointed by the President by and with the advice and consent of the Senate, shall receive compensation at the rate now or hereafter prescribed by law for the under secretaries referred to in section 104 of the Federal Executive Pay Act of 1956 (5 U. S. C. 2203), shall perform such functions as shall be delegated or assigned to him pursuant to the provisions of this reorganization plan, and shall act as Director during the absence or disability of the Director or in the event of a vacancy in the office of Director.

(d) There shall be in the Office three Assistant Directors of the Office of Defense and Civilian Mobilization, each of whom shall be appointed by the President by and with the advice and consent of the Senate, shall receive compensation at the rate now or hereafter prescribed by law for assistant secretaries of executive departments, and shall perform such functions as shall be delegated or assigned to him pursuant to the provisions of this reorganization plan.

(e) The Office and the Director thereof shall perform such functions as the President may from time to time delegate or assign thereto. The said Director may from time to time make such provisions as he shall deem appropriate authorizing the performance by any officer, or by any agency or employee, of the Office of any function delegated or assigned to the Office or to the Director.

SEC. 3. *Regional directors.*—There are hereby established in the Office so many new positions, not in excess of ten existing at any one time, with the title "Regional Director", as the Director of the Office shall from time to time determine. Each Regional Director shall be appointed under the classified civil service, shall be the head of a regional office of the Office of Defense and Civilian Mobilization, shall perform such functions appropriate to such regional office as

may be delegated or assigned to him pursuant to the provisions of this reorganization plan, and shall receive compensation which shall be fixed from time to time pursuant to the classification laws as new or hereafter amended except that the compensation may be fixed without regard to the numerical limitations on positions set forth in section 505 of the Classification Act of 1949, as amended (5 U. S. C. 1105).

SEC. 4. Membership on National Security Council.—The functions of the Director of the Office of Defense Mobilization with respect to being a member of the National Security Council are excluded from the scope of the provisions of section 1 (a) of this reorganization plan and are hereby transferred to the Director of the Office of Defense and Civilian Mobilization.

SEC. 5. Civil Defense Advisory Council.—The Civil Defense Advisory Council, created by section 102 (a) of the Federal Civil Defense Act (50 U. S. C. App. 2272 (a)), together with its functions, is hereby transferred to the Office of Defense and Civilian Mobilization.

SEC. 6. Abolitions.—The offices of Federal Civil Defense Administrator and Deputy Administrator provided for in section 101 of the Federal Civil Defense Act (50 U. S. C. App. 2271) and the offices of the Director of the Office of Defense Mobilization and Deputy Director of the Office of Defense Mobilization provided for in section 1 of Reorganization Plan Numbered 3 of 1953 (67 Stat. 634) are hereby abolished. The Director of the Office of Defense and Civilian Mobilization shall make such provisions as may be necessary in order to wind up any outstanding affairs of the offices abolished by this section which are not otherwise provided for in this reorganization plan.

SEC. 7. Records, property, personnel, and funds.—(a) The records, property, personnel, and unexpended balances, available or to be made available, of appropriations, allocations, and other funds of the Office of Defense Mobilization and of the Federal Civil Defense Administration shall, upon the taking effect of the provisions of this reorganization plan, become records, property, personnel, and unexpended balances of the Office of Defense and Civilian Mobilization.

(b) Records, property, personnel, and unexpended balances, available or to be made available, of appropriations, allocations, and other funds of any agency (including the Office of Defense and Civilian Mobilization), relating to functions vested in or delegated or assigned to the Office of Defense Mobilization or the Federal Civil Defense Administration immediately prior to the taking effect of the provisions of this reorganization plan, may be transferred from time to time to any other agency of the Government by the Director of the Bureau of the Budget under authority of this subsection for use, subject to the provisions of the Reorganization Act of 1949, as amended, in connection with any of the said functions authorized at time of transfer under this subsection to be performed by the transferee agency.

(c) Such further measures and dispositions as the Director of the Bureau of the Budget shall determine to be necessary in connection with the provisions of subsections (a) and (b) of this section shall be carried out in such manner as he shall direct and by such agencies as he shall designate.

SEC. 8. Interim provisions.—The President may authorize any person who immediately prior to the effective date of this reorganization plan holds an office abolished by section 6 hereof to hold any office established by section 2 of this reorganization plan until the latter office is filled pursuant to the said section 2 or by recess appointment, as the case may be, but in no event for any period extending more than one-hundred-and-twenty days after the said effective date.

SEC. 9. Effective date.—The provisions of this reorganization plan shall take effect at the time determined under the provisions of section 6 (a) of the Reorganization Act of 1949, as amended, or on July 1, 1953, whichever is later.

Mr. Finan, you may now come forward, if you will, please. You have a prepared statement. I suggest that you present it.

STATEMENT OF WILLIAM F. FINAN, ASSISTANT DIRECTOR FOR MANAGEMENT AND ORGANIZATION, BUREAU OF THE BUDGET; ACCOMPANIED BY FRED E. LEVI, ASSISTANT CHIEF, OFFICE OF MANAGEMENT AND ORGANIZATION, BUREAU OF THE BUDGET; AND JOHN J. CORSON, DIRECTOR, MCKINSEY & CO.

Mr. FINAN. Mr. Chairman, with your permission, I would like to have a member of my staff, Mr. Levi, join me at the table, as well as Mr. John J. Corson, who is a director of the firm of McKinsey & Co., who made the recent study that forms a great deal of the background for reorganization plan No. 1.

Mr. HOLIFIELD. We will be glad to have your associates present.

Will Mr. Corson testify for his company or for the Budget Bureau?

Mr. FINAN. He will testify for his company, sir, and strictly in terms of the report which he made to the Bureau. He takes responsibility for that report and we take responsibility for everything beyond it.

Mr. HOLIFIELD. For the plan?

Mr. FINAN. Yes, sir.

Mr. Chairman and members of the committee: I am pleased to have this opportunity to appear before your committee in connection with its hearings on Reorganization Plan No. 1 of 1958, which is designed to improve and strengthen Federal organization for preparing and mobilizing the Nation for nonmilitary defense activities.

The subject of organization for nonmilitary defense, or portions of it, has been studied many times, in both the legislative and executive branches, and also by interested outside groups. This committee has been responsible for one of the most far-reaching investigations of this subject; its findings were a significant part of the background leading to the reorganization plan now before you.

A major finding of this committee was that the civil defense planning activities—broadly defined—of the Office of Defense Mobilization and the Federal Civil Defense Administration should be merged. This plan will bring about the merger.

With the objective of developing solutions to the organizational problems which had been identified by the earlier studies, the Bureau of the Budget, after consulting with the Office of Defense Mobilization and the Federal Civil Defense Administration, engaged a management consulting firm to develop a detailed scheme of reorganization.

The management firm undertook an intensive study of the two agencies with the full cooperation of Mr. Gray, Governor Hoegh and their entire staffs. The results of the firm's study were made available to the two agencies, and their views were fully taken into account by the President in the preparation of Reorganization Plan No. 1 of 1958.

The President had the benefit of an interim report from the consulting firm as well as information developed in previous investigations in reaching the conclusion, stated in his 1959 Budget message, that because of the rapid advances in military science there now exists a serious overlap between the Federal Civil Defense Administration and the Office of Defense Mobilization in carrying out the central planning and coordination of our nonmilitary defense programs.

The President further concluded that these central functions should be vested in no one short of the President. His reasons were, first, that new requirements flowing from a changing military science will necessitate changing administrative arrangements in this field and, second, that it is appropriate to vest these functions in the President because they transcend the responsibility of any single department or agency.

The principal statutory provisions relating to nonmilitary defense planning activities are found in the National Security Act of 1947, the Defense Production Act of 1950, and the Federal Civil Defense Act of 1950. These statutes vest these central functions differently.

The National Security Act provides that the Office of Defense Mobilization shall advise the President with respect to our preparedness plans.

The Defense Production Act authorizes the President to develop defense mobilization preparedness programs, and this duty has been delegated to the Director of the Office of Defense Mobilization.

The Federal Civil Defense Act places the function of preparing for a civil-defense emergency in the Federal Civil Defense Administrator.

At the time that those statutes were enacted, hydrogen bombs, radiological fallout, and missile delivery were not immediate factors in defense planning. Events in these fields have greatly expanded the nature and concept of survival planning for a civil-defense emergency.

Survival planning now and in the future must include planning for a possible attack which might affect vast areas of the country and require the use of all available resources, human and material, in the survival effort. Under such planning assumptions, it is vital that the inseparability of defense mobilization and civil defense be recognized.

The various statutory assignments, each of which appeared to be perfectly logical at the time of its enactment, are now producing an overlap of effort. It has become extremely difficult to provide central direction and coordination to the Federal agencies involved in nonmilitary defense planning.

The States and localities, which, in the final analysis, must make a most important contribution to our preparedness effort, have similarly suffered from a lack of clear and uniform guidance from the Federal Government.

Certain functions authorized by other statutes are also involved in the reorganization. Principal among these are the stockpiling functions authorized by the Strategic and Critical Materials Stockpiling Act and vested in the Director of the Office of Defense Mobilization.

MAJOR FEATURES OF THE PLAN

Reorganization Plan No. 1 will eliminate the existing dual organizational structure and will make possible stronger and more effective arrangements in the future.

The major features of the reorganization plan are (1) the transfer to the President of the functions vested by law in the Office of Defense Mobilization and the Federal Civil Defense Administration, and (2) the consolidation of the Federal Civil Defense Administration, and the Office of Defense Mobilization into a new agency, the Office of Defense and Civilian Mobilization, in the Executive Office of the President.

The transfer of functions to the President will accomplish several highly desirable objectives. Our preparedness activities directly involve most of the major departments and agencies and require the wholehearted cooperation of States and localities, as well as many public and private organizations. Such activities are clearly far beyond the scope of any single department or agency.

The transfer is thus a recognition of the fact that central leadership in this area is and must continue to be a direct responsibility of the President.

Moreover, the vesting of the functions in the President will make it possible for him to utilize to the optimum degree the many departments and agencies necessarily involved in carrying out the widespread preparedness activities which make up our nonmilitary defense effort.

The formation of the Office of Defense and Civilian Mobilization in the Executive Office of the President, by consolidation of the Office of Defense Mobilization and the Federal Civil Defense Administration, will provide the President with a single staff agency for assisting in planning and directing the entire range of activities in this extremely complex and crucial program area.

This step will not only eliminate the present dual sources of planning and coordination of nonmilitary defense preparedness efforts, but will also bring into being an agency which is capable of looking at the problem in its totality and which possesses the status which is appropriate to its central policy and coordination functions.

When Reorganization Plan No. 1 takes effect, it is expected that the President will delegate to the Director of the Office of Defense and Civilian Mobilization the functions now imposed by law on the Director of the Office of Defense Mobilization and on the Federal Civil Defense Administrator, and also Presidential functions at present delegated to those officials.

It is also expected that the President will continue, for the time being, the existing assignments of duties to other departments and agencies.

The review of the now-existing Federal Civil Defense Administration and the Office of Defense Mobilization delegations to the departments and agencies and the development of new Presidential assignments, for the consideration of the President, will be among the first tasks of the new office. Such new assignments will seek to eliminate confusion arising out of the present overlapping assignments and to assure the effective use of the capacities of the departments and agencies as a part of a program in which all levels of government must participate.

The fact that the President will make the assignments directly will serve to emphasize that the activities are of direct concern to the President and should be considered important responsibilities of the departments and agencies, and not peripheral or secondary missions.

SUPPORTING FEATURES OF THE PLAN

Officials of the Office of Defense and Civilian Mobilization. The reorganization plan makes provisions for the head and other necessary major officials of the new agency.

Membership on the National Security Council. Under the reorganization plan, the Director of the Office of Defense and Civilian Mobilization will become a statutory member of the National Security Council in place of the director of the Office of Defense Mobilization, whose membership stems from the National Security Act of 1947.

In that connection, it should be pointed out that since July 17, 1956, the Federal Civil Defense Administrator, as well as the Director of the Office of Defense Mobilization, has participated in National Security Council proceedings and in Cabinet meetings, at the request of the President.

Civil Defense Advisory Council. The Civil Defense Advisory Council created by section 102 (a) of the Federal Civil Defense Act, together with its functions, is transferred by the plan to the Office of Defense and Civilian Mobilization.

That Council, which includes governors, mayors, and private citizens, serves as a link between State and local agencies and the Federal Government. The Council will be maintained so that it may continue to serve that important purpose.

CONCLUSION

To sum up the purpose and effect of the plan, it will provide much greater effectiveness and efficiency in dealing with what have come to be the inseparable jobs of planning civil defense and defense mobilization preparedness programs. It provides the machinery for eliminating confusion in those programs. It should be possible to achieve a higher state of readiness under the reorganization plan than has heretofore been possible.

Perhaps even more importantly, Reorganization Plan No. 1 of 1958 creates an organization capable of looking at the total problem of preparing for a national emergency.

Finally, the plan is based upon the recognition that, because civil defense is a vital part of our total national security posture, it should properly be associated with the President and the Executive Office of the President.

The Bureau of the Budget strongly urges that the Congress permit this plan to go into effect.

That concludes my prepared statement, Mr. Chairman.

Mr. HOLIFIELD. Thank you, Mr. Finan. This plan as presented to the Congress is certainly an important plan, and it is worthy of consideration by this committee and the Congress.

It goes quite a distance in some areas which seem to be unique, and I believe it would be well to explore thoroughly the facets of the plan and the provisions of it in as orderly a way as possible.

If it be the will of the members of the subcommittee, I will pursue a list of questions here which have been prepared with the purpose of getting on the record the intricate and sometimes complicated relations which will come about as a result of this plan if it is adopted into law.

At any time any of the members wish to break in for clarifying questions, questions will be welcome. If this is agreeable to the committee, I will proceed with the line of questions which the staff has prepared.

Mr. Finan, in transmitting the plan, the President stated :

Initially the Office of Defense and Civilian Mobilization will perform the civil defense and defense mobilization functions now performed by the Office of Defense Mobilization and the Federal Civil Defense Administration. One of its first tasks will be to advise me with respect to the actions to be taken to clarify and expand the roles of the Federal departments and agencies in carrying out nonmilitary defense preparedness functions. After such actions are taken, the direction and coordination of the civil defense and defense mobilization activities assigned to the departments and agencies will comprise the principal remaining responsibility of the Office of Defense and Civilian Mobilization.

Can you advise us whether this statement contemplates the delegation of most ODM and FCDA functions to other agencies ?

Mr. FINAN. To begin with, Mr. Chairman, the final decision on this matter will, of course, have to be made by the President. We also would anticipate that a major consideration in the President's decisions will be the advice he receives from the director of this new agency when it is brought into existence.

So, the best we can do for the committee, at this point, is to give you our best judgment and our anticipation of what the President may do after having received such advice, as well as the advice of other agencies concerned, such as the Bureau of the Budget.

At the present time, and as this committee is aware, a number of major agencies of the executive branch are performing civil defense or defense mobilization duties by assignment or delegation from either FCDA or ODM, or, in quite a number of cases, both.

For example, the Department of Agriculture has delegations from both agencies, as is also true of Commerce, Labor, the Housing and Home Finance Agency, and the Department of the Interior.

There are other agencies that have delegations from one or the other. That is to say, from either ODM or FCDA.

As the President stated, we anticipate that one of the first important jobs that will be taken on by the new agency will be to review these outstanding delegations which will remain in effect after this plan takes effect, and make a series of proposals to the President which will result in the substitution of Presidential Executive Orders, making assignments to other executive departments and agencies in a single series of articulated Presidential orders, in contrast to the present dual arrangement.

It is further anticipated on the basis of studies which we have made and which Mr. Corson's firm has made that a reasonable anticipation would be that this subsequent series of Presidential delegations would go beyond the delegations that have been made at the present time by FCDA and ODM, combined.

It is not anticipated, however, that the new Office of Defense and Civilian Mobilization will propose a series of delegations which would have the effect of, shall we say, substantially liquidating itself.

We anticipate that the new central agency would retain unto itself very important functions of coordinating, of evaluating, of encouraging and of otherwise having a major impact upon the performance of these duties by the respective delegate agencies.

We would also anticipate that there are certain very important duties which by their nature it is reasonable to expect should and would continue to be performed centrally. Those duties, for example, would include what we consider to be the extremely vital responsibility of carrying on a program of public and official education, of continuing certain types of leadership training in behalf of State and local civil-defense officials, and of not only continuing research that is presently being conducted in certain fields such as shelter design, radiological detection and that sort of thing, but we agree with the findings and recommendations of the firm that there is room here for probably an expanded and intensified and a broader field of research straight across the board which needs to be conducted on a central basis which, without being able to specify about it, we would anticipate would produce future adjustments, changes and modifications in our civilian mobilization programs.

Mr. HOLIFIELD. That is a very long answer and you have covered a lot of territory. To break your answer down, you have in effect said that you cannot advise us at this time of the specific delegations which will be made to other agencies. You cannot advise us specifically as to what delegations will be made at this time?

Mr. FINAN. If you like, Mr. Chairman, we can go further than I have gone in being specific about what we would anticipate.

In its report Mr. Corson's firm went into very great detail on this subject and made a series of quite specific recommendations for future action.

Mr. HOLIFIELD. Are you adopting all of their recommendations?

Mr. FINAN. In a broad sense I would say that the Budget Bureau will be prepared to support, when the time comes, the recommendations made by Mr. Corson's firm in that regard.

In a specific sense, I would say there would be no really significant deviations from it in terms of what we will be prepared to recommend and support.

With that as a background, if you would like for Mr. Corson to discuss this, since he worked into it in much greater detail than of course I personally have had an opportunity to do, I would be glad to have him do it. He is here for that purpose, if you wish.

Mr. HOLIFIELD. At this time we will not request that because we will find ourselves with all of our time gone, and at the end of it, all we will have before us will be the McKinsey plan. What we have before us today is the reorganization plan.

So if we have to have hearings on the McKinsey report in order to study the plan, of course we could go into all of the details of the McKinsey study.

So, for all intents and purposes you cannot advise us at this time the specific delegation of ODM and FCDA functions to other agencies, but you have assured us that you will go beyond the present delegations which have been performed by those agencies.

In your answer to me I think you said that.

Mr. FINAN. I said our recommendations would anticipate that, yes, sir.

Mr. HOLIFIELD. Would there be any legal bar to the delegation of all civil-defense functions to other agencies under this plan?

Mr. FINAN. As a layman, Mr. Chairman, that is a difficult question for me to answer.

Mr. HOLIFIELD. It shouldn't be, because the plan envisions placing all statutory powers which now exist in these agencies in the person of the President, and the President is given authority under the plan to delegate these present statutory functions where and when he pleases.

Mr. FINAN. I would say that as a strictly legal proposition, the President probably could delegate all of the functions involved in this plan to agencies other than the newly created Office of Defense and Civilian Mobilization, except the function of being a member of the National Security Council, which under the plan would be vested in the head of this new agency and not in the President.

On the other hand, as a strictly practical matter, such an arrangement is unthinkable and it would leave the President alone in the position of attempting to do all of the planning, the coordinating, the reviewing and everything else that would be involved in managing a dispersed set of responsibilities of that kind.

Mr. HOLIFIELD. The answer is that there is no legal bar to the delegation of all civil-defense functions to other agencies if the President desires to do so, and there is also no legal bar to his failure to delegate any specific functions which are now required by statute of the agency involved, because you would have those functions placed in the person of the President.

You do not know of any specific civil-defense function which could not be delegated, do you?

Mr. FINAN. Mr. Chairman, I will have to be a little careful in answering this question because it is one that probably should be answered by a representative of the Department of Justice.

I am aware, however, that there has been—I will put it this way: I know of no situation in which the President has delegated the function that involved the issuance of a Presidential proclamation. I am not prepared to say whether that has been because the President has had legal advice that there was a legal impediment or whether successive Presidents have decided as a matter of policy that when the Congress enacted a function that involved the President proclaiming something they expressed, shall we say, the intent of Congress that the President should hold that function to himself.

But there is in connection with title II of the Federal Civil Defense Act the issuance of a Presidential proclamation. I would not be able to assure the committee on that one whether as a legal matter the President could or could not delegate it. I do not know at this point.

Mr. HOLIFIELD. Do you know of any reorganization plan in the past which has transferred all of the functions of a major statutory agency directly to the President?

Mr. FINAN. To my knowledge, sir, there has been no such plan.

Mr. HOLIFIELD. Assuming that it is wise and necessary to have the proposed new agency subject to the direct control of the President, is

there any major agency or department in the executive branch which is not subject to the direct control of the President at the present time?

Mr. FINAN. Mr. Chairman, if there is any department or agency of the executive branch which is not subject to the direction and control of the President at the present time, I do not know of it. It is true there are some functions vested in some subordinate officers of the executive branch where the language involved is not "direction and control," it is "direction and supervision." But whether there is any real meaning behind those differences, I do not know. I would think not.

Mr. HOLIFIELD. It is true, however, that while each Cabinet head is subject to the President's direction and control, the Congress has seen fit to place statutory obligations and duties and methods of procedure on the different agencies, and those agencies are responsible to the Congress for the fulfillment of those statute-imposed duties and responsibilities, are they not?

Mr. FINAN. Mr. Chairman, that is a rather complicated question and I am not sure just how to give you a short and direct answer. It is true that in a number of cases Congress has placed limitations upon the President in the exercise of his duties as the Chief Executive. I would put it that way.

For example, in the case of appointments, in certain cases he has to receive and consider certain nominations. In other cases his appointment power is limited to persons possessing certain qualifications.

Similarly, in some cases his removal authority is circumscribed in the sense that people are appointed for fixed terms, and in other cases, principally the regulatory commissions, there are specified reasons for removal—misfeasance, malfeasance, inefficiency and neglect of duty, I think is normally the list of reasons specified in the statute for presidential removal.

Mr. HOLIFIELD. These, of course, are based upon statutory standards?

Mr. FINAN. These are all based on statutory standards, yes, sir.

Mr. HOLIFIELD. And therefore, while the President has the power of appointment and the power of directing the execution of policy, the functions of the department, whether it be the Agriculture or Labor Department or any other department—Defense Department—they do have certain prescribed standards and limitations and functions which have been required of them by statute and which are the guide for the conduct of the department.

Is that not true?

Mr. FINAN. That is true, and I would say it is also true of a number of the functions that are involved in this reorganization plan.

Mr. HOLIFIELD. In this reorganization plan, by virtue of the fact that you place the authority in the President, you place in him the power of decision as to whether those functions shall be carried out or whether they shall be abrogated by lack of action. The degree to which they shall be performed, as well as all matters of procedure, are left to the President to decide. Is that not true?

Mr. FINAN. Mr. Chairman, if I understood you to suggest by the use of the word—I believe it was "abrogate"—that the President would have the power to nullify a statute or to repeal a statute simply by not delegating to anyone its performance, I don't think I could agree with you.

The only authority that this plan gives the President that he doesn't have today is the authority to decide what officers or agencies of the executive branch should administer these functions. He isn't given authority to broaden any of these functions, nor is he given authority to repeal any of the statutes that are involved in this plan.

As a matter of fact, insofar as it gives him authority to decide what officer or agency of the executive branch should perform these functions, he already has that authority in a very broad way in the field in question in that most, if not all, of the laws that are involved in this reorganization plan, or more accurately that are now being administered by ODM or FCDA—that would be a better way of putting it—involve statutes where the functions involved are either wholly vested in the President, or where very important or critical functions in the act are vested in the President.

We are not dealing with a situation here in which—

Mr. HOLIFIELD. I think this is true of the ODM, but I question your application of that thought to the FCDA because there is quite a number of statutory requirements in FCDA.

Mr. FINAN. In the case of FCDA, Mr. Chairman, I mention one act where the entire program is vested in the President. It is the National Disaster Act, which has been delegated to the FCDA.

With respect to the Civil Defense Act itself, the only function there that I can recall from memory which is presidential in character now as distinct from being vested in FCDA is under title III, the function of proclaiming a civil-defense emergency.

That is a function which the Congress vested in the President, the President has never delegated it, and regardless of this legal issue we talked about a few minutes ago, I would assume that as a matter of policy the President would not delegate it.

Mr. HOLIFIELD. I would agree with you that that is one function he certainly would not delegate. If he did, I think it would certainly do violence to the whole intent of the Congress in placing those powers in the President and for his sole execution on his own judgment.

Can you tell me what specific advantages would accrue to the new agency by virtue of being in the Executive Office of the President?

Mr. FINAN. The advantages that will accrue to the new agency have their roots in the principal characteristics of the program that we are currently dealing with. Traditionally, Executive Office agencies have principally had functions of two types. One involves advising and assisting the President in the discharge of his own direct duties and responsibilities, and the other has been the coordination of activities which extended beyond the scope of any single agency, ranging from involving two or three agencies to being governmentwide in character.

We believe that with the experience we have not only had with the present program, but with other programs that have had similar characteristics, that by reason of being in the Executive Office of the President, the head of this new agency and his principal subordinate officials and assistants will be in a much stronger position, first, to assist the President and to advise the President in matters in this field which is of very critical importance and extreme complexity; secondly, in their relationships with the heads of the other executive branch

agencies with which they must necessarily be in daily contact on very important matters; and thirdly we think that it will be of great advantage to the head of this agency in his relationships with governors, mayors and other important officials of State and local government.

Mr. HOLIFIELD. Do you consider this an elevation of the functions of these two agencies to a higher level in the Government structure than they now have?

Mr. FINAN. By reason of vesting the functions in the President, Mr. Chairman, we feel that they are being very substantially elevated, and we think that by then providing that the agency which will assist the President in their administration shall be in the Executive Office, we have given it a status which is appropriate for that type of responsibility.

Mr. HOLIFIELD. Assuming there might be a national civil defense plan developed, do you think that it would have more prestige and more acceptance by virtue of being in the Executive Office of the President than in the agencies as they are now constituted?

Mr. FINAN. Of course the Office of Defense Mobilization is now in the Executive Office, but the National Civil Defense Plan, as I understand it, is a responsibility of the Federal Civil Defense Administration. I think a plan of that character coming out of the Executive Office should have more status and more standing and more acceptance than it has coming from an independent agency.

Mr. HOLIFIELD. Notwithstanding the fact that it would become a part of the overall mobilization responsibility—the civilian mobilization responsibility—do you feel that the FCDA functions would be carried out with a higher degree of authority and a greater acceptance on the part of other agencies?

Mr. FINAN. Yes, sir; and I would anticipate that the plan itself should be more comprehensive, more effective, and in general a better plan by reason of being prepared by an agency that has a total perspective and a total responsibility in this area as against an agency which has responsibility for only part of it.

Mr. HOLIFIELD. From time to time the President has stated that nonmilitary defense functions should be vested "in no one short of the President." Does this mean—and does the reorganization plan imply—that the President plans to take a greater and more direct interest in nonmilitary defense matters?

Mr. FINAN. Mr. Chairman, I cannot answer that question with either a yes or a no. If there is any inference in the question that the President has not taken an interest in these matters up to the present time, in my judgment, it is not warranted.

Mr. HOLIFIELD. There was certainly no inference intended in the question. The question sought to find out if the placing of the FCDA in the office of the President indicated an elevation to a more important place, and, therefore, the receiving of more attention than it has as an independent agency.

Mr. FINAN. Let me try to answer your question this way, Mr. Chairman. I would prefer to say that I would anticipate that the President's efforts in this field following this reorganization will be more effective, let's say, by reason of the fact that he will no longer have to devote some of his time, at least, to dealing with the problem of coordinating two agencies—which this committee itself has indicated

are repeatedly operating in fields which overlap to an extreme and to a very complicated degree; that it should free up the President in this area so that, shall we say, to the extent that he gives attention to this area, it is on matters that should be requiring the President's attention as against matters that are being thrust upon him by reason of having two agencies operating in substantially the same field.

Mr. HOLIFIELD. The committee has found, of course, a great many overlapping functions and overlapping delegations and a complicated maze of delegations in its study of the functions of FCDA. You believe that some of this confusion would be eliminated and the President would be presented with coordinated plans in the civil-defense field, rather than with separate plans and suggestions from two different agencies?

Mr. FINAN. Yes, sir. I not only think the plans would be coordinated, but I would think by reason of their flowing out of an agency with a comprehensive responsibility that they should be better plans. They will be different than you are now getting out of this split arrangement.

Mr. HOLIFIELD. Do you feel that because the FCDA will be part of a comprehensive mobilization planning effort its functions will be minimized to any extent?

Mr. FINAN. Just the contrary, Mr. Chairman.

Mr. HOLIFIELD. You think that they will be increased?

Mr. FINAN. Yes, sir, I do. I think the combination of these two responsibilities in a single agency will strengthen both. I think it will result in a single total approach to the whole problem of nonmilitary defense that will have a beneficial effect on every aspect of it, whether it is something that is being performed today by ODM or something that is being performed today by FCDA.

Mr. HOLIFIELD. In view of the fact that all of the functions would be placed in the Executive Office of the President and would be carried out in effect by Executive orders, would this not put the officers of the new agency in a position to claim executive privilege in their dealings with the Congress?

Mr. FINAN. No, sir. There is no connection between the performance of a function under delegation from the President by Executive order and the matter of executive privilege.

To use one example, the Budget Director performs an immense array of duties under Executive orders as well as certain statutory duties. No distinction has ever been made by any Budget Director as between one and the other in the matter of claiming executive privilege.

The executive privilege issue runs to personnel in the White House Office as distinct from other parts of the Executive Office. To my knowledge no one in the Budget Bureau or, for example, the Office of Defense Mobilization, has attempted to claim executive privilege.

Mr. HOLIFIELD. We have been trying for 2 years to obtain copies of the recommendations made by Mr. Peterson when he left the Office of the Administrator. This committee has not been given those recommendations to date.

Mr. FINAN. That type of executive privilege, Mr. Chairman, as you know envelops all presidential staff work. Where a matter involves a recommendation to the President or preliminary staff work leading up to presidential action, I believe it is generally regarded as one where executive privilege is appropriate.

Mr. RIEHLMAN. Mr. Chairman, before you get off of this question dealing with the President taking a greater interest and the need for a greater interest in the nonmilitary defense matters, I myself am not one to say that there was any implication that the President has not taken an interest in it. I am sure the chairman feels the same way.

But is it not true that the studies that this committee has made and the recommendations it has presented to the executive department, as well as to the legislative branch of our Government, have urged an immediate and greater interest in this field. Because of the changing times which we are facing in the world and in our own Nation today there is a need for the President to take a greater interest in this thing to see that there is greater coordination of our activities in the non-military field than there has been before?

Mr. FINAN. Well, Mr. Riehlman, I still can't accept the premise that there is a need for a greater presidential interest. For example, the very fact that the President under the reorganization act prepared this particular reorganization plan and laid it before the Congress seems to me evidence of very great presidential interest in this matter.

Mr. RIEHLMAN. I agree with you. But isn't it based on the fact that certain studies have been made? Certainly the reports that we have before us here by the McKenzie Company have referred in great detail to the studies that have been made. The necessity for a greater interest on the part of the Government in this field has brought this to the President's attention, as well as the changing world conditions and what our country is faced with in possible devastation in future warfare.

Mr. FINAN. I think there is general agreement that this particular problem area is one that is becoming more and more acute, and there is need for a greater interest in it; or let us say we are going to be required, whether we like it or not, to devote more and more attention to it as time goes on.

That applies to every man, woman and child in the United States, not only the President, and not only the Congress.

Mr. RIEHLMAN. I certainly am not saying this to be critical of the President, but I do think that if we are interested in the reorganization plan, we are also interested in the President's position and his approach to this program. We are interested in bringing to the attention of the American people not only the reorganization plan but the need for a greater interest of all of our people, in civilian life particularly, in this field of nonmilitary defense.

Mr. FINAN. Yes, sir, I would heartily agree with that.

Mr. HOLIFIELD. Of course the main objective of this committee over the past 2½ years has been to achieve a greater interest in and a more effective civilian defense plan; and without any imputation at all intended in the question that was asked here, the committee's recommendations over the years have all indicated that we do not think that enough interest has been given by the Administrator of FCDA in the past and by the President and by the Congress.

We have been equally critical of ourselves as well as of others because we feel that the problem has not been faced up to.

I wonder why, instead of a reorganization plan, a basic legislative act has not been sent up to the Congress to establish in a statutory fashion a department which has such a tremendous and important responsibility as the protection of 175 million American people from enemy attack.

My concern is whether you are going far enough in this—not that you may not be making a step, but as to whether you are going far enough or not.

How would the funds for the new agency be budgeted?

Mr. FINAN. The funds for the Office of Defense and Civilian Mobilization proper, we are assuming, would be submitted to the Congress in the form of an appropriation request for that agency. There is still an open issue as to the manner in which the budget for the delegate agencies will be submitted.

It can be submitted either in the form of a consolidated appropriation to this new office, or as a consolidated appropriation to the President. This is an item again on which we would want to await the advice of the head of this new office before the Budget Director himself made a recommendation to the President.

As you know, Mr. Chairman, in the case of both ODM and FCDA, working with the appropriations committees we have gone at this matter of financing these delegated functions in a variety of ways. I think both the executive branch and the appropriations committees are now firmly of a view that at least for the foreseeable future the best manner to use in attempting to finance them is with a single consolidated appropriation, out of which funds are allotted.

When you go beyond that and get down to the specific point of whether into this pattern you would propose that the consolidated appropriation be made to the President or to the Office of Defense and Civilian Mobilization, we haven't crossed that last bridge yet.

Mr. HOLIFIELD. It wouldn't make a great deal of difference as far as the delegating of the funds was concerned whether the funds were made directly to the President, or whether they were made to the director, as long as the power was in the President. The President could either directly allocate these funds, or he could order the director of the new office to allocate the funds where he wanted them.

In both instances the basic authority would rest in the President as to the allocation of funds to the delegate agency, would it not?

Mr. FINAN. That is correct, sir. It would be largely symbolic, I would say, if the funds were appropriated to the President. But I personally would attach a great deal of importance to that.

Mr. HOLIFIELD. You say you would attach importance to it?

Mr. FINAN. Yes, sir, I think it would be an important symbolism—if you want to use that term—in asking that this money be appropriated to the President as an indication of importance to the President of this total program.

How much difference that would make to anybody else, I am not sure. In this case I am largely expressing a personal view.

Mr. HOLIFIELD. But this would place in the President's hands, you might say, a blank check on such budget funds as are requested. For instance, last year it was some \$80 million; and this year some \$39 million, I believe. But that would place in his hands that amount of money for allocation as he saw fit.

Mr. FINAN. No, that wouldn't be the plan. Let's take the Civil Defense Administration today. Their appropriation is broken down in terms of a number of categories. To the extent you have functions performed directly by the Office of Defense and Civilian Mobilization, we would assume that the same arrangement would apply.

If funds are appropriated for grants to States for any purposes, those would be broken out and separately identified and separately appropriated. If funds are appropriated for major research activities, those would be separately identified and separately appropriated.

It is only when you get to the point—

Mr. HOLIFIELD. You mean in the justification for the original—

Mr. FINAN. No, sir, I am talking about appropriation language. Question arises only when you get to the point of where, let us say, does the Department of Health, Education, and Welfare get its money to perform the civilian mobilization functions that have been assigned to it by the President. Would it get it from a single appropriation made to the President and then allocated to Health, Education, and Welfare? Or would it get it from a single appropriation to the Office of Defense and Civilian Mobilization, out of which funds would be allocated to that department as well as to all of the other delegate agencies?

Mr. HOLIFIELD. In view of the fact that you have already testified that there will be greater delegation than obtains at the present time, and there will be only a few major coordinating functions left in the FCDA, it would follow that the majority of the funds for performing the functions of any kind would be allocated directly by the President, would it not?

Mr. FINAN. No, Mr. Chairman. I apparently gave you a somewhat erroneous impression of how much further we anticipate this delegating would go. We do not see it going so far as to really make a very substantial difference in, let's say, the size of this new agency and the size of ODM and FCDA added together.

As a matter of fact, some of the delegations that are under contemplation and will be suggested to the new director when he appears on the scene really amount to the delegation of functions which, because they have been retained in FCDA as of today, are being performed only to a very limited degree and you would get an enlarged performance in this particular area by reason of delegation.

Mr. HOLIFIELD. From page 2 of the President's message I read you the following:

Initially the Office of Defense and Civilian Mobilization will perform the civil defense and defense mobilization functions now performed by the Office of Defense Mobilization and the Federal Civil Defense Administration. One of its first tasks will be to advise me with respect to the actions to be taken to clarify and expand the roles of the Federal departments and agencies in carrying out nonmilitary defense preparedness functions. After such actions are taken, the direction and coordination of the civilian defense and defense mobilization activities assigned to the departments and agencies will comprise a principal remaining responsibility of the Office of Defense and Civilian Mobilization.

So apparently from that message, initially all of the delegation will be preserved as now; and then it will be clarified and expanded so we can anticipate that there will be more delegations to other agencies than exist at the present time, according to the President's message.

Mr. FINAN. We anticipate that. But we would not anticipate it to go back so far as to reduce the central agency to an agency that in itself was performing no duties of any consequence.

Mr. ROBACK. It will permit that, however, Mr. Finan?

Mr. FINAN. There is no doubt about that.

Mr. ROBACK. The way the plan is drawn, the Office of Defense and Civilian Mobilization does not have to perform any civil defense functions. Is that right?

Mr. FINAN. That's perfectly correct as a matter of, say, a narrow legal view of it. But as a practical matter, it is an unthinkable situation.

Mr. ROBACK. Congress is always presented with the problem of whether they should legislate for all possibilities or only for those that they would like to see. That is a constant problem. It is implicit in many ways in this reorganization plan, is it not?

Mr. FINAN. It is implicit here, but it is no more implicit here than it is practically any time a bill is laid before the Congress. You have to assume competent and responsible administration of a given program and legislate on that basis. Otherwise you couldn't legislate at all.

Mr. HOLFIELD. That's true, but there are no guidelines or standards being set up by the Congress in this instance. All of this is left to the President, and such statutory obligations as are now incumbent upon the Federal Civil Defense Administration and the Office of Defense Mobilization change from their status as a statutory obligation and are placed in the President personally, and he is given the authority to delegate where and when and how much he sees fit of these now existing statutory responsibilities, as I see it.

Mr. FINAN. There is no doubt about that at all, Mr. Chairman.

Mr. ROBACK. I was going to say, in section 1 (a) of the plan, the functions of these two agencies are transferred to the President. In section 2 (e) of the plan, on page 4 of the House document, the President can designate any agency to perform the functions. But while the plan accomplishes a merger of the two agencies, the plan also permits the President to put those functions in any agency, and in effect make this new agency either a shell of an agency or abolish the agency as far as that goes.

I am just talking about the permissible—

Mr. FINAN. These are permissible as a legal matter under this plan. There is no debate about that at all. There is just the one function he can't reach—that is, assuming you have a head for the agency, the head by law will be a member of the National Security Council. That's correct.

Mr. HOLFIELD. On the other hand, the plan would not create any greater civil defense authority than now exists, would it?

Mr. FINAN. No, sir.

Mr. HOLFIELD. Because the reorganization plan is limited by law in creating new functions, and therefore there is no greater scope or authority given in the plan for a greater function than now exists under the statutes.

Mr. FINAN. That's perfectly correct.

Mr. HOLFIELD. Can you tell me if there is anything in the legislative history of the Reorganization Act of 1949, as amended, which

indicates that the Congress intended that any reorganization plan should result in a transfer of functions from a statutory agency to the President himself?

Mr. FINAN. The only way I can answer that question, I believe, Mr. Chairman, is in two respects. Unless I am mistaken, in plans transmitted under prior reorganization acts, provisions of that kind have been included. That is to say, functions have been transferred from statutory agencies to the President.

The Congress did not challenge that and did not see fit to write a prohibition into the act of 1949 against repeating it.

Mr. HOLIFIELD. Are you speaking of the plan that was submitted in 1953?

Mr. FINAN. No; earlier plans, Mr. Chairman.

Mr. HOLIFIELD. In most of those instances, though, they were very minor functions, were they not? They were not major functions.

Mr. FINAN. They were not a sweeping approach such as is involved in this plan. But whether you call them major or minor is another question.

Mr. HOLIFIELD. You could not cite any case aside from the present plan where the entire functions of a permanent statutory agency such as FCDA have been transferred to the President?

Mr. FINAN. No; I don't believe there is any.

Mr. HOLIFIELD. This is a new departure and a new widening of the procedure under the Reorganization Act of 1949, as amended. It goes much further than any other plan has ever gone in the placing of major statutory functions in the person of the President.

Mr. FINAN. Mr. Chairman, I am afraid I can't agree with your statement that this is a widening of the reorganization act.

Mr. HOLIFIELD. It is a widening of the element of transfer of statutory authority in that it goes much further than any plan has ever gone in transferring statutory functions to the President for Executive order direction.

Mr. FINAN. It is true that this plan transfers in one plan more functions to the President than has been true in earlier plans. But it is also true that on quite a number of occasions the President has transmitted, and the Congress has seen fit to allow the taking effect of, reorganization plans that transferred functions to the President.

It is perfectly clear from a reading of the act that a provision of this kind is authorized. There is no doubt about the legal authority for this.

If we were looking to precedents, Mr. Chairman, I would prefer to look at direct acts of Congress for what I would consider to be rather clear precedents for an arrangement of this kind than the use of the reorganization act.

I think the fact that we are using the reorganization act to bring about an arrangement of this kind is more or less incidental.

Let me illustrate——

Mr. HOLIFIELD. It may not be incidental, because it may be setting a precedent which will in effect give to the President perpetual powers of reorganization within a department or a group of departments in which he can continue by Executive order to reorganize any time he wants to in the future.

Once given the complete basic power to reorganize these departments, future reorganizations within the scope of these two departments would not have to be submitted to the Congress for congressional consideration in view of the fact we have given him *carte blanche* complete authority to exercise his judgment through future Executive orders within the scope of these two agencies' functions.

Mr. FINAN. This will only become a precedent, Mr. Chairman, if the President at some future time attempts to use it as a precedent.

Mr. HOLIFIELD. The point we have to consider is, once this particular plan is passed, the President can direct any function to any agency which he wishes to direct a function to. He can take it back; he can cause it to be a larger exercise of duty and responsibility, or a smaller exercise of duty and responsibility merely by an Executive order.

So in effect he can continuously reorganize these two departments' functions and redelgate and recall any function which he has delegated.

Mr. FINAN. Mr. Chairman, I would like to express myself—

Mr. HOLIFIELD. Is that not true?

Mr. FINAN. May I answer that question at a little bit of length, with your permission, Mr. Chairman, because it is very important?

Mr. HOLIFIELD. Yes; but to be responsive to it, isn't it true that this is the case? You could answer me that, and then give me your long answer.

Mr. FINAN. My short answer will be no.

Mr. HOLIFIELD. All right, that is good. Now go ahead and tell us why.

Mr. FINAN. The reason for that is this, Mr. Chairman, that there is a very peculiar set of characteristics involved here, in these programs, in that they have to be administered by a large number of agencies of the executive branch. We see no alternative to that—

Mr. HOLIFIELD. Not necessarily, not under the law. This may be your intention.

Mr. FINAN. As a matter of developing a really effective program in this field, as a purely practical matter, we don't see how you can do it without the current and the active participation of many executive agencies.

Mr. HOLIFIELD. The Chair doesn't see how you can do it by delegating all the functions to different agencies. The Chair is afraid that the functions may fall between the cracks in the floor.

Mr. FINAN. That is a different issue than you raised on this precedent matter, and I would like to direct my attention to that. Let me say for the sake of argument and from where we sit, we feel that we have got to harness the Department of Agriculture, the Department of Health, Education, and Welfare, and the Housing and Home Finance Agency—and for that matter, the Department of Defense, and quite a number of other agencies.

I say that the precedent for vesting functions in the President when you have that sort of situation has its roots in rather substantial numbers of acts of Congress.

To illustrate, the Marshall plan, when it was originally enacted by Congress, vested practically all of the functions—indeed, all of the important functions—in the President in order that he might harness a large number of agencies of the executive branch in their performance.

The Defense Production Act of 1950 was another example of that kind. All of the functions under that act were vested in the President. And there are other precedents that we can cite of that general character.

Mr. HOLIFIELD. In the case of the Marshall plan, this was considered necessary in view of the fact that the President has charge of the foreign policy by the Constitution. The dealing with foreign nations is placed in the office of the Presidency, and of course it would be very difficult for the Department of Agriculture to carry out a function over in England without carrying it out through the State Department, let us say.

So it was found necessary to do this as an emergency measure, and I believe the Defense Production Act also contemplated an emergency situation, did it not?

Mr. FINAN. Yes, it did.

Mr. HOLIFIELD. And rested upon that.

Mr. FINAN. The situation we have before us today deals with the most catastrophic type of emergency anybody can contemplate.

Mr. HOLIFIELD. Do you contemplate that the President will operate under a declaration of emergency in this field?

Mr. FINAN. Not until an emergency arises.

Mr. HOLIFIELD. That is a different proposition. When an emergency arises, then you operate under an emergency act. But prior to an emergency arising, you are giving what amounts to emergency powers to the President without an emergency being declared.

Mr. FINAN. As we said before, we are not giving the President any powers beyond what have already been put on the statute books. This is an emergency, Mr. Chairman. Your subcommittee has certainly been more eloquent on this point than any other group that I know about. We are not going to be able to deal with the emergency when it arises unless we have adequately prepared for it in advance.

Mr. HOLIFIELD. Let's stop right there. The FCDA Act did provide that in the case of the declaration of an emergency, the FCDA Administrator was given extraordinary powers. So by statute you have that conferred upon you.

Mr. FINAN. That's right.

Mr. HOLIFIELD. For potential use.

Mr. FINAN. But it can only be triggered off by the President.

Mr. HOLIFIELD. But the other functions of the FCDA were functions based on statute and were to be exercised in peacetime. Is that not true?

Mr. FINAN. Yes, sir; but their whole objective is to equip this Nation to deal with an emergency.

Mr. HOLIFIELD. I recognize the objective. I am talking about the procedures used to attain that objective, the difference between granting what amounts to emergency powers without the declaration of an emergency and depending upon statutory laws for functions.

Mr. FINAN. To get back to our precedent point, I can only say that this plan can only be argued as a precedent against the background of other situations where numerous agencies of the executive branch had to be brought into a coordinated program; and that nobody in the future can argue that because the President submitted this plan and the Congress allowed it to take effect that some President in the future will send up a plan that would transfer all of the functions of, let's

say, the Department of Commerce and the Department of Agriculture to him so that thereafter he could switch them around as between those agencies or the rest of the executive branch as he might see fit.

Mr. HOLIFIELD. I think it is very clear cut. I am not saying this would happen. I think it is a very clear-cut precedent.

Mr. FINAN. I see no possibility for a valid argument that this plan would be a precedent for a thing of that kind.

Mr. HOLIFIELD. Legally I think it is a precedent. We may disagree on that. Is there anything in the legislative history of the Reorganization Act of 1949 which indicates that Congress intended the definition of an agency subject to reorganization to include the President?

Mr. FINAN. There is no doubt about that. It includes "officer," and the President is certainly the Chief Officer of the executive branch. That is under section 7, "Definition of Agency."

Mr. ROBACK. The question, Mr. Finan, is not whether the definition includes everything in the executive branch, but the question is whether in the context of the act and the permissible authorities under the act it was intended that the President himself would be able to take unto himself transferred functions.

That is the question as to what the intent of the Congress was. The Budget Bureau, after examining the intent of Congress, is called upon for a response.

Mr. FINAN. I cannot say whether there was any discussion in the hearings on this act as to whether the President is an officer of the executive branch.

Mr. ROBACK. Let's pursue—

Mr. FINAN. Let me finish my answer to your question. However, there have been a series of subsequent reorganization plans which did transfer functions to the President and to my knowledge they were never challenged on this ground.

Mr. ROBACK. Let's illustrate the problem this way. Suppose the Federal Civil Defense Agency in testing for shelter designs at Frenchman's Flats causes fallout which Farmer Jones claims has caused his sheep herd to sicken and die and he wants to put in a damage suit against the Government.

Can he put in a damage suit against the FCDA?

Mr. FINAN. There is a peculiar provision in the Civil Defense Act that would need to be cited. It has to do with damage suits. It may have a bearing on this. There is also the question of anybody suing a sovereign.

Mr. ROBACK. Let's assume that he has permission from the sovereign to sue. Under these transferred functions where would the suit lie?

Mr. FINAN. I presume that the suit would lie with the FCDA. Frankly, I think you are injecting a question here that ought to be directed at the Department of Justice, although there is a direct provision on this point in the Reorganization Act itself.

Would you like me to read it?

Mr. ROBACK. Yes.

Mr. FINAN. Section 9 (b):

No suit, action or other proceeding lawfully commenced by or against the head of any agency or other officer of the United States in his official capacity or in relation to the discharge of his official duties shall abate by reason of the

taking effect of any reorganization plan under the provisions of this act; but the court may, on motion or supplemental petition filed at any time within 12 months after such reorganization plan takes effect, showing a necessity for a survival of such suit, action or other proceeding to obtain a settlement of the questions involved, allow the same to be maintained by or against the successor of such head or officer under the reorganization effected by such plan; or if there be no such successor, against such agency or officer as the President shall designate.

Mr. ROBACK. Who is the successor under this reorganization plan?

Mr. FINAN. To begin with—

Mr. ROBACK. Can you answer that question?

Mr. FINAN. No, I can't answer that question as it is phrased.

Mr. ROBACK. Look at section 1 (a) of the plan and read that to the committee.

Mr. HOLIFIELD. Read section 1 (a) of the plan.

Mr. FINAN. Wait a minute—

Mr. ROBACK. Read section 1 (a) of the plan to the committee and we can determine—

Mr. FINAN. That won't answer your question. Your first question would be, can anybody now sue the Federal Civil Defense Administration under the circumstances you have described? I have to say I don't know the answer to that question.

Mr. ROBACK. Then the second point was, let's assume that it can be sued. Let's waive that because you don't know the answer. Then let us say we assume it can be sued. Then the next question is, against whom would the suit lie, since the reorganization plan does not disallow the abatement of the suit? Are you following the point?

Mr. FINAN. Are you assuming that suit is now being made against FCDA and what happens after this plan takes effect? Or are you assuming after the plan takes effect, somebody runs a test out at Frenchman's Flats and somebody gets damaged?

Mr. ROBACK. Suppose the suit is pending now. I am sure there must be some that are pending now.

Mr. FINAN. If it is pending now, it is quite clearly taken care of under this section of the act I just read.

Mr. ROBACK. Are you saying that the suit will lie against the President? The powers are vested in the President.

Mr. FINAN. No. In the first place, it will probably be a suit against the United States Government and not necessarily against FCDA. Whoever it is against, it is obviously quite completely covered in this section 9 (b) that I just read.

Mr. ROBACK. Who is the successor agency under this plan? Aren't the powers transferred to the President?

Mr. FINAN. The powers would be transferred by the President and then subsequently delegated. The President wouldn't be out at Frenchman's Flats firing off a bomb.

Mr. ROBACK. I might add that neither would the President be before this committee to justify his administration of the Federal Civil Defense Act.

Mr. FINAN. No, he doesn't have to. He has to justify it to the people of the United States every 4 years.

Mr. ROBACK. That is one of the points at issue here. Every time you vest these powers in the President, the committee deprives itself of an opportunity to examine the head of the agency on his trus-

teeship in discharging the functions which the Congress vested in him.

Mr. FINAN. I wouldn't agree that that is an issue in this reorganization plan at all.

Mr. ROBACK. That follows under the reorganization plan if you put the powers in the President. Administrator Hoegh will come before the committee. Administrator Peterson came before the committee. The President will not come before the committee, but he has acquired those powers.

Mr. FINAN. The head of the new Office of Defense and Civilian Mobilization will appear before the committee.

Mr. ROBACK. He will be in an ambiguous relationship to the committee and to the President by virtue of the fact that he will act in the capacity of adviser to the President. He will in that capacity acquire a whole area of Executive privilege. That's the problem that this committee—

Mr. HOLIFIELD. And immunity from congressional interrogation.

Mr. FINAN. Only with respect to matters on which he is advising the President. As you just indicated, you have had this difficulty with the Civil Defense Administrator.

Mr. HOLIFIELD. But he is going to be advising the President on all matters. I have some personal experience with this capacity in the person of Admiral Strauss, who occupies a dual role. He is the Chairman of the Atomic Energy Commission with one hat. He puts on another hat and he is the adviser to the President.

What he does as adviser to the President cannot be interrogated. It has been attempted, and he has refused to answer. This is a matter of confidence between Mr. Strauss and the President.

I submit that we will be creating an agency here where the director of this office will be in the same position from the standpoint of claiming Executive immunity and Executive privilege for matters on which he has advised the President and would not be subject to interrogation by this committee or any other committee.

Mr. FINAN. Mr. Chairman, every officer of the executive branch has the problem of Executive privilege when he is in the role of advising the President. But only with respect to his advice to the President.

Mr. HOLIFIELD. Yes. But you are transferring all the functions in this instance, and they depend upon Executive delegation and not upon statutory enactment.

Mr. FINAN. But there is virtually only one function here that has anything to do with advising the President, and that is the present duty of the Director of the Office of Defense Mobilization under the National Security Act of 1947.

To the extent—

Mr. ROBACK. Mr. Finan, on that point, that is a major function of the ODM. When the Defense Production Act expires, that is all the ODM has to claim for its existence.

Mr. FINAN. No.

Mr. ROBACK. In other words, a major component of this Reorganization Plan is the advisory functions of the ODM Director to the President.

Mr. FINAN. No, the ODM is performing a variety of functions now under various statutes and Executive orders.

Mr. ROBACK. Which are derivative—

Mr. FINAN. The Defense Production Act has become one of the minor functions of ODM, really.

Mr. ROBACK. Those are assigned functions which are derivative in the first instance under the National Security Act and in the second instance, under temporary legislation, which is the Defense Production Act.

Mr. FINAN. The Stockpile Act is not temporary legislation, and that is a major function of ODM, placed on it by law. The Trade Agreements Act, oddly enough, has got an ODM function in it.

Mr. ROBACK. Mr. Finan, we are having one of our friendly arguments here.

Mr. FINAN. Sure.

Mr. ROBACK. Those functions originally were in the Department of Defense. They were transferred to the ODM Director by the reorganization plan. Now they are further transferred to this office under the reorganization plan.

The question there is, how far away from the original congressional mandate for exercising this authority are you getting?

Mr. HOLIFIELD. This is a very interesting discussion. I want to change at this time to another point. Section 5 (a) of the Reorganization Act of 1949 publishes a list of prohibitions. It starts out with this language:

No reorganization plan shall provide for, and no reorganization under this act shall have the effect of, (1) abolishing or transferring an executive department or all the functions thereof or consolidating any two or more executive departments or all the functions thereof.

How do you reconcile the plan, particularly with the latter part of that paragraph 1, and I refer to "or consolidating any two or more executive departments or all the functions thereof?"

Mr. FINAN. My answer to that, Mr. Chairman, is that we are not here dealing with two executive departments.

Mr. HOLIFIELD. Would you refer that to a cabinet level?

Mr. FINAN. The executive department in the constitutional sense, yes, sir. That has always been our understanding, that that is what this prohibition ran to.

Mr. HOLIFIELD. Is there anything in the legislative history of the Reorganization Act of 1949 which indicates that the authority to delegate contained in the act includes the authority to delegate outside the agency?

Mr. FINAN. Mr. Chairman, let me ask Mr. Levi to answer that question for you. He has been involved in that particular aspect of far more reorganization plans than I have.

Mr. HOLIFIELD. Most of the reorganization plans that I remember gave full authority to the President, or gave specific authority to effect certain specific transfers within a department. I do not recall the details of authority outside of a department.

Mr. FINAN. We are dealing here, Mr. Chairman, with a very technical problem in that a number of the acts that are involved in this reorganization contain their own authority to delegate, and in order that this committee can get the best possible answer to this question

you have raised, with your permission I would like to refer it to Mr. Levi.

Mr. HOLIFIELD. Mr. Levi.

Mr. LEVI. On your specific question, does the legislative history indicate authority to delegate outside the agency: As far as I know it does not. I supplement that by saying I assume that delegation implies assignment of functions to subordinates, so that, in the case of a department, it might be argued that delegation by the department head means delegation to his subordinates.

In the case of the President, it would mean delegation to his subordinates. And, again, the President is one of the agencies by definition who may, via reorganization plan, be authorized to delegate, and to delegate to subordinates.

Mr. HOLIFIELD. That presents a very fine line of reasoning and I admire you for coming up with it. However, I cannot recall any plan, and I handled 45 reorganization plans during the 4 years I was chairman of the reorganization committee, which actually included authority to delegate outside of an agency. This clearly does.

It actually sets up a delegating agency, an agency whose main function is to delegate in this new agency.

Mr. FINAN. Here, however, Mr. Chairman, we are relying on a number of statutes other than the reorganization act in the matter of delegation.

For example, you will recall that the Civil Defense Act not only authorizes the Civil Defense Administrator to delegate—and this is clearly outside of his agency—but there is a little flavor in there of a mandate, a congressional expectation that considerable delegation will take place.

As I recall, there are somewhat similar provisions in the Defense Production Act with respect to the delegation of functions.

Mr. HOLIFIELD. So this plan would really carry on delegatory powers which exist in the separate agencies at the present time?

Mr. FINAN. Yes, sir.

Mr. ROBACK. Are you saying, Mr. Finan, that the authority to delegate does not rely on the reorganization act in this case?

Mr. FINAN. The authority for the President to make delegations after this reorganization plan takes effect will be affected by the reorganization plan itself, by the Civil Defense Act which has provisions in that respect, by the Defense Production Act, and then by the act which we have gotten in the habit of calling the McCormack Act, which was handled by the full House Government Operations Committee some years ago, which has to do with the authority of the President to delegate, and then of course there is the whole question of the inherent authority of the President under the Constitution to delegate.

Mr. ROBACK. We understand that. But this plan is submitted by virtue of and under the authority of the reorganization act, is it not?

Mr. FINAN. Yes.

Mr. ROBACK. Is that the case for the delegation of authority which stands or falls on the authority to delegate under this act, as far as this plan is concerned?

Mr. FINAN. I wouldn't agree with that, and I would suggest that if the committee has a serious concern about this feature of the plan,

it would be an appropriate matter for testimony by a representative of the Department of Justice rather than a representative of the Bureau of the Budget.

Mr. ROBACK. Are you not aware that the Department of Justice refuses as a matter of principle to advise a committee on legal matters?

Mr. FINAN. But they have advised the President, and they have advised us. If the committee really considers this to be a serious matter, we will endeavor to take it up with the Department on a specific basis.

Mr. ROBACK. Before we do that, let us just consider for a second the authority to delegate. That authority in the reorganization act was first conferred in 1949. Is that not right, Mr. Levi?

Mr. LEVI. I believe so.

Mr. ROBACK. And that authority to delegate, in the contemplation of the committee—there was some serious concern about it—was to allow certain routine trivial functions of heads of agencies which plagued and bothered them to be delegated to subordinates. Wasn't that the theory?

Mr. LEVI. I don't recall any limitation respecting routine or minor.

Mr. ROBACK. You will find in the discussion of the legislation in this committee that that was the concern, and the committee report on the subject says that the idea behind the delegation is to take away routine and petty things.

Here we have something much different from routine and petty functions of the President.

Mr. FINAN. I believe you are thinking of the legislative history of the so-called McCormack Act, rather than the Reorganization Act.

Mr. ROBACK. I am thinking of the legislative history of the Reorganization Act of 1949.

Mr. FINAN. I don't recall anything like that in the history of the Reorganization Act of 1949, and the act has been used often in connection with functions that obviously were going to require the most major kind of delegation.

Mr. ROBACK. The committee report said in connection with the new authority to delegate—this committee's report—"the main purpose is to make it possible for top officials to delegate routine functions which are vested in them by law in such manner as to prevent delegation."

There was a legal problem at the time whether certain types of routine functions such as those considered in the McCormack Act could be delegated, and the Reorganization Act also dealt with those routine types of functions.

Now you have a serious problem before the Congress whether under the caption of "Routine Functions" you will allow the President to distribute the civil defense functions throughout the Government.

The Chairman was referring to various reorganization plans. There was one precedent for this, in Reorganization Plan No. 3 of 1953, which vested in the ODM Director authority to make cross-agency delegations. That plan was approved by the Congress without any consideration. There was no disapproval resolution as I recall, and no debate on the issue.

But we are now considering the issue—perhaps belatedly.

Mr. FINAN. Aren't you talking about, for example, reorganization plans affecting most of the executive departments in which all of the

functions of the department were transferred to the Secretary and he was given power to delegate. It can hardly be argued that those involved minor delegations.

It involved the total statutory functions of the departments in question. In a few cases there were some very minor exceptions, but in some cases there were no exceptions at all.

Mr. ROBACK. The possibility of making tremendous delegations was considered by the committee, and the people who sponsored the plan gave assurance that such types of delegations were not contemplated.

Whether or not it is legal, and we were discussing the chairman's question as to the intent, it is never too late for the Congress to re-examine intent.

Mr. FINAN. No; it is never too late for that. No Congress can bind a succeeding Congress in any event.

Mr. HOLIFIELD. Dr. Flemming, when he appeared before the subcommittee in April 1956, was asked about this authority that we have just been speaking of as outlined in this Reorganization Plan No. 3 of 1953, which authorized the director in section 3 (b) of that plan to authorize any other agency head or subordinate by redelegation to perform any of the functions transferred by the plan.

So he appeared before the subcommittee and was asked about this authority and he said he could not recall that any plan other than the one applying to ODM had provided for such cross-agency delegation. That was his answer at that time.

Mr. Levi, do you care to respond?

Mr. LEVI. Mr. Chairman, this somewhat touches on your question, and also on your earlier question on that point. In this instance, involving the President, Reorganization Plan No. 1 in 1947 transferred to the President functions under the Alien Property Act with respect to the Philippines—I should say under the Trading With the Enemy Act with respect to the Philippines. And it provided further—

shall be performed by him or subject to his direction and control by such officers and agencies as he may designate.

Mr. HOLIFIELD. Is this the Trading With the Enemy Act?

Mr. LEVI. Yes, sir; to the extent that it pertained to property in the Philippine Islands. So there was an instance in which functions were transferred to the President, and without using the word "delegation," authorized performance by officers and agencies to be designated by the President.

Mr. HOLIFIELD. Was that not again because of the involvement with other nations, and recognizing the inherent power of the President in matters of foreign affairs?

Mr. LEVI. I hardly believe so.

Mr. HOLIFIELD. But that factor did pertain?

Mr. LEVI. I cannot assure that it didn't enter in, but I have no recollection of it entering in.

Mr. HOLIFIELD. This present plan contains the same authority in section 1 (b) as that contained in Reorganization Plan No. 3 of 1953, except that the President is authorized to delegate, whereas the previous plan said any function could be performed by any other agency when authorized by the Director.

That is the only difference in language.

Mr. ROBACK. What is the significance of that difference?

Mr. HOLIFIELD. When the President does delegate a function which is placed in him, who is responsible for its performance?

Mr. FINAN. To begin with, of course, under the Constitution the President is responsible for the performance of the entire executive branch. But in answer to your question, the individual to whom it is delegated.

Mr. HOLIFIELD. Is responsible?

Mr. FINAN. Is responsible; yes, sir.

Mr. HOLIFIELD. Is he responsible to the President or is he responsible to the Congress?

Mr. FINAN. To both. He is responsible, I would say, to the same extent as though the function were vested in him by law.

Mr. ROBACK. There was a big discussion at the previous hearing on civil defense as to the relative responsibilities of Mr. Flemming and Mr. Peterson with regard to their delegated functions. In the case of the Federal Civil Defense Act, it provides for delegating responsibilities. In the case of the Office of Defense Mobilization, it refers to some other kinds of delegations. Mr. Flemming insisted he was responsible. Any time any problem came up that someone had to be held accountable for, they could put the finger on him.

In the case of Mr. Peterson, the issues were not so clear-cut. In any event, if the President delegates under this and there is non-performance, who is responsible?

Mr. FINAN. Ultimately, the President is. The President cannot delegate responsibility for anything that occurs in the executive branch, whether he delegated it by Executive order or whether the function is vested in his subordinate by statute.

Mr. ROBACK. But except for impeachment he is not accountable to the Congress.

Mr. FINAN. He is not accountable except for impeachment, that's right. But in the sense if you are asking if there would be a distinct difference from the point of view of Congress as to this matter of executive privilege, is there any difference in the status of an agency head when he is performing a function vested in him by statute as against a statutory function delegated to him by the President, I say there is no significant difference.

Mr. ROBACK. Except that he is clothed in one case with certain powers of the President and certain authorities which the President from time to time asserts against the Congress.

Mr. HOLIFIELD. Isn't it true that if he is subject to the definition of his task through Executive order, that there is an element of control of the degree to which the functions shall be performed, which does not pertain in the case of statutory language obligating the person for a specified group of duties?

Mr. FINAN. By Executive order the President cannot enlarge the powers that are being delegated, but he does on some occasions lay down terms or conditions or limitations in connection with their performance. That, of course, is also true in numerous cases where functions are vested by the Congress by statute in a subordinate officer of the executive branch, too.

Mr. HOLIFIELD. Mr. Fascell?

Mr. FASCELL. No questions.

Mr. HOLIFIELD. Mr. Riehlman?

Mr. RIEHLMAN. Mr. Chairman, we have had a very interesting discussion here and legal interpretations that, not having a completely legal mind, I have been unable to follow all the way through.

But it does seem to me that we are dealing with a different type of reorganization plan than we ever had before. First of all, we have ODM, which is in the Office of the President at the present time. ODM has the direct authority to delegate certain activities to be carried on. We are transferring now FCDA and its functions into ODM, and all of them will be directly under the President.

Certainly we are taking and transferring certain statutory authorities under FCDA directly over to an administrator, and he is directly responsible to the President.

Am I correct in that assumption?

Mr. FINAN. I don't think you described the effect of this plan precisely, Mr. Riehlman—

Mr. RIEHLMAN. Let's have it precisely.

Mr. FINAN. With respect to two points: The first is that the functions which are presently vested by law in ODM and FCDA will be transferred not to this new, consolidated agency but to the President, with the understanding the President will make certain delegations directly.

Mr. HOLIFIELD. No; with the understanding he will make delegations but not certain delegations, because we have no knowledge as to the extent of those delegations or which ones will be delegated.

Mr. FINAN. By "certain," Mr. Chairman, I meant selected delegations rather than something which had been established definitely as to what they would be.

The second point, Mr. Riehlman, with reference to under the direct control of the President, as of today the Director of ODM is no more and no less under the direct control of the President than is the Civil Defense Administrator, and the head of this new agency likewise will be under the direct control of the President.

This is true of the Secretary of Defense, the Secretary of State, and the Budget Director for that matter. They are all under the direct control of the President.

Mr. HOLIFIELD. But when you take the functions which now obtain by statute and apply to the FCDA Administrator, when you place those functions in the President and give him the power to delegate functions as he sees fit, you place in the President the automatic power of modification, not addition, but of modification by diminution of those statutory functions now required of the FCDA Administrator.

I am not saying that the President will diminish them, but I am saying that you do place along with the functions the power of delegation and, therefore, the power of modification downward.

Mr. FINAN. You only give him the authority to decide who shall administer the function. As of now, the law says the Civil Defense Administrator must administer certain functions. Under this new arrangement, the President can say "I don't want the head of Agency X to administer these functions any longer. I want it done by Agency Y."

But in the doing of that, he can neither enlarge the powers involved and the functions, nor can he diminish them. He only gets flexibility in deciding who shall carry them out, and this is a feature of this plan that, in view of the character of the program involved, and the shape of the program involved, and the shape of the future, so to speak—perhaps I should more accurately say the lack of shape to the future right now—we attach very great importance to this flexibility on the part of the President.

Mr. RIEHLMAN. Is it true that he can not diminish or eliminate any of the statutory authority now vested in FCDA?

Mr. FINAN. No, sir; he cannot.

Mr. RIEHLMAN. And he cannot expand them to any great degree?

Mr. FINAN. No, sir.

Mr. RIEHLMAN. In other words, all he can do is delegate the authority?

Mr. FINAN. That's correct.

Mr. HOLFIELD. Is it mandatory that he so delegate?

Mr. FINAN. No, sir.

Mr. HOLFIELD. Then by failure to delegate, he can actually abolish the functions which he is prohibited from doing under the basic Reorganization Act?

Mr. FINAN. No, sir, the President is responsible under the Constitution for the faithful execution of the laws. If the President were to say "I am going to liquidate this program," notwithstanding what the statute books say, by just not delegating it to somebody, then I would say he is no longer carrying out his constitutional duties.

If on the other hand he says "This particular function is of such critical importance, it involves the making of a decision that in my judgment only the President should make and I, therefore, am reserving this to myself," which he has done in many cases where programs have been vested in him and he has the legal authority to make the delegation, then he obviously is giving the greatest consideration to his constitutional responsibilities and is making a perfectly appropriate decision not to delegate—in this case it is usually what will be called a power. He thinks it should be only exercised by the man directly accountable to all the people.

Mr. LIPSCOMB. Isn't it possible to diminish a delegated power by just not allocating the funds that the Congress has appropriated by law?

Mr. FINAN. Obviously any program can be enlarged in scope, so to speak, depending on the extent to which it is financed. The civil-defense program obviously can be enlarged a great deal or diminished a great deal by either appropriating more or less money.

Mr. LIPSCOMB. In this case you say that the President couldn't enlarge on any functions or couldn't diminish any functions. He could diminish them just by not telling the Bureau of the Budget to allocate the funds, couldn't he?

Mr. FINAN. In that sense that is a flexibility that both the President and the Congress have in their respective roles, to enlarge or diminish let's say, the size of a program. But in the legal sense it is not authority to enlarge or shrink a function. It is just the speed and the scope and the extent to which you carry out a function that you can, of course, flexibly adjust and do every year.

Mr. HOLIFIELD. In fairness to the record, I think that the President's right to withhold appropriated funds, funds which the Congress has appropriated by budgetary orders, is pretty well proven for even statutory functions. I think in one instance several wings of aircraft were authorized, the money was appropriated, and the money was not spent.

Mr. FINAN. I seem to recall that incident, Mr. Chairman.

Mr. FASCELL. Mr. Chairman, just for the sake of the record, if I may, I would just like to say that I don't—

Mr. HOLIFIELD. I wasn't saying that in the nature of rebuttal.

Mr. FASCELL. No, I just want to be sure that I don't concur in that conclusion because I don't agree at all in the President's prerogative in that respect.

Mr. HOLIFIELD. Many of us do not agree.

Mr. FASCELL. I mean as a matter of law. I don't mean as a matter of personal opinion. I don't think he has that right. He exercises it.

Mr. HOLIFIELD. I am of the same opinion exactly as the gentleman from Florida on that. But nevertheless we have been faced with this situation at different times, and there has been no resolution of the same. This would apply, regardless of whether it was a statute or a plan. This exercise of the power to withhold funds by the Budget Bureau could apply.

Mr. FINAN. This plan has no bearing on that.

Mr. HOLIFIELD. That is the point I wish to make.

Mr. ROBACK. In the budgetary sense, the problem is whether the President will get all the funds for the delegated functions or whether they will be distributed directly by the Congress. That is an unsettled issue in this plan and could be a crucial issue as to whether the civil defense functions are strengthened or not. Isn't that so?

Mr. FINAN. This has been a very difficult issue now for the past several years, and I do not think it is in any way aggravated by this plan. It is simplified in that you are dealing with it in 1 package instead of, as you have had to do in past years, in 2, because the issues come up in connection both with functions delegated by ODM and functions delegated by FCDA.

At one point we are doing it in exactly the opposite manner. We were appropriating a central fund as I recall, for the FCDA, and we were appropriating directly to the delegate agencies for ODM.

Mr. ROBACK. But in view of the President's declared intent to delegate, it raises a fundamental question whether that technique isn't in fact frozen by this plan. This plan would constitute a congressional intent that the FCDA functions be administered by delegation, because the President has made clear his position on the matter.

Mr. FINAN. It would be by delegation from the President, but not necessarily by—

Mr. ROBACK. This committee has taken a contrary position in this report. It has said that this delegating function does not properly serve the administration of the civil defense function in the Federal Government.

Mr. HOLIFIELD. Our experience in following these delegations in the past, where there was overlapping, or duplication, or confusion has been that the delegation of functions in the different agencies of

Government become of minor significance to the department which gets them.

Therefore, they are ignored and shifted around and given very little consideration.

I have but to call to your mind the \$17,000 which was transferred to the Housing and Home Finance Agency for the purpose of studying urban vulnerability. I think one man and a secretary were assigned to discharge the duty of studying urban vulnerability in the United States.

Of course this being such a minor duty in this Housing and Home Finance Agency, whose major mission was in another direction, it became lost and fell through the crack. We followed other delegations to the Public Health Service and to others, and we found the same thing obtained, that where it was delegated, the responsibility was diffused and the program suffered.

This whole basic theory of delegation in my opinion is the theory which has kept us from having an efficient operating agency, and I can see no promise of efficiency in a future function which will be separated and delegated to many different governmental agencies. Again I think we will be faced with lack of efficiency in the setting up of an effective program.

Mr. FINAN. Mr. Chairman, you may have us up here in a few years under this arrangement and with great validity may be in a position to say "I told you so."

On the other hand, it is our feeling that first of all unless we can find some device for effectively harnessing practically the whole executive branch, as well as State and local governments, we can't make much progress toward the solution of this problem.

Mr. HOLIFIELD. There is a difference of opinion as to how to do that. One theory is to do it by delegation, and the other is to perfect a plan and then proceed to get it done in the best way possible.

In other words, that is putting the horse before the cart.

But we feel that the delegation of responsibility for developing functions is one of the factors which has caused us to fail to have what we consider an effective civil defense.

Mr. RIEHLMAN. Isn't that true, Mr. Chairman, under our present FCDA plan where, under statute, they have authority to delegate?

Mr. HOLIFIELD. That's right.

Mr. RIEHLMAN. And we haven't felt it has been effective.

Mr. HOLIFIELD. That's right.

Mr. RIEHLMAN. Apparently, taking into consideration many of our recommendations and also legislation we have introduced, there has been a decision on the part of the Administration to take a part of a step here, and to bring into being a more forceful and effective FCDA program by bringing these two activities together and eliminating as much as possible the duplication that has been carried on, and then give it greater effect, I believe, by having Presidential authority to some degree behind it.

Mr. FINAN. We think there have been three major factors missing in our efforts in the past to make this delegation arrangement work. First, the delegations have been coming from two sources, and they have been the sources of difficulty.

Secondly, one of the sources has been an agency which is not, quite frankly, regarded as even the peer of the executive departments—the Civil Defense Administration.

We would like to see what would happen when the President assigned these responsibilities.

Thirdly, we would like to try to carry them out for once with some money. To try to ask agencies to take on work of this kind in a setting where its utility is for the future, it is not required to do today's business, is difficult enough. It is preparation for the future, and to require them to do it, as the chairman has indicated in the case of HHFA for \$17,000, is asking too much.

Until we have tried it and have met these three difficulties that have been quite apparent in what we have been doing in the past—eliminating dual delegation, of having the assignment made by the President, and of financing these operations, we are not prepared to say that it won't work.

In fact, we are convinced at this moment that if we meet these three conditions, it will work.

Mr. LIPSCOMB. In regard to that third condition, in regard to finances, I think in any discussion of the program both before this committee and in case it goes to the floor, that there has to be an answer to the question the chairman asked: How will the funds for the new agency be budgeted?

In other words, I feel the Bureau of the Budget and the President should come to grips with the problem and supply an answer to that question before we get too far along in this program.

To me, of course, that is one of the prime questions in this whole thing. If you don't have the money, the delegation is no good.

Mr. FINAN. The executive branch has already reached an understanding with the House Appropriations Committee which will carry over under this new arrangement. That is, there will be a central appropriation for all of these delegated functions, and then there will be allocated within the executive branch to Health, Education, and Welfare, Agriculture, and so on.

The Appropriations Committees do not want to attempt to directly appropriate funds to the departments for these functions. The executive branch has accepted that position.

The only open issue as to what change might be made under this reorganization plan is whether the President will request that this central appropriation be made to the President himself, or whether he will request that it be made to the Office of Defense and Civilian Mobilization. That is the only loose end.

Mr. LIPSCOMB. That is a more complete answer than you gave the chairman previously.

Mr. FINAN. I am sorry, I intended to say the same thing.

Mr. HOLIFIELD. I think it would be well if you would ask the Director of the Budget to prepare a letter on this point that Mr. Lipscomb has raised; either that, or we can have him down here and question him directly on it, because I think this will be an important issue on the floor of the House if this does go to the floor.

I think we should have the answer from the Director, sir, if you will convey my request.

Mr. FINAN. The Director will be happy to do that, either with a letter or with testimony, as the committee may wish.

Mr. HOLIFIELD. What are the members wishes on that—a letter or a personal appearance of the Director?

Mr. RIEHLMAN. Personally my feeling is that I am sure Mr. Finan knows what we are asking for, and if we get a direct letter to place in the record as to the Director of the Bureau of the Budget's position on this matter, it will be sufficient, instead of bringing him up here to question him, because our time will be limited to some degree on the other witnesses, Mr. Chairman.

Mr. HOLIFIELD. What do you feel about it? Is that satisfactory?

Mrs. Griffiths?

Mrs. GRIFFITHS. Yes.

Mr. HOLIFIELD. Mr. Lipscomb will that be satisfactory?

Mr. LIPSCOMB. Yes.

Mr. HOLIFIELD. Then if you will have this letter giving us a little bit more specific detail on this matter over the signature of the Director of the Budget, we will include it in the permanent record at this point.

(The letter referred to follows:)

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D. C., May 13, 1958.

HON. CHET HOLIFIELD,
*Chairman, Subcommittee on Military Operations,
Committee on Government Operations,
House of Representatives, Washington, D. C.*

MY DEAR MR. CHAIRMAN: In accordance with the request made at the hearing before your subcommittee on May 6, 1958, on Reorganization Plan No. 1 of 1958, I am writing you to outline our views on the financing of the functions covered by the plan.

As indicated in Mr. Finan's testimony on May 6, it had not then been determined whether to request that appropriations for financing these functions be made directly to the President or to the new Office of Defense and Civilian Mobilization. It now has been decided that the latter procedure will be followed.

The requests for appropriations to be made to the Office of Defense and Civilian Mobilization would be justified by the Director of that Agency. It is expected that the requests would be broken down into several appropriation items covering such activities as operating expenses, emergency supplies and equipment, research and development, grants to States, and disaster relief.

The appropriation for operating expenses would include funds for functions delegated to other agencies. This would be consistent with the views expressed by the Committee on Appropriations of the House in acting on the 1959 budget estimates. Of course, the need for funds for such delegated functions would be covered in the usual budget justification which would be presented by the Director of the Office of Defense and Civilian Mobilization.

While the details of the estimates may change from time to time, and are, of course, dependent upon further consideration by the Appropriations Committees and final action by the Congress, I believe the foregoing will provide the subcommittee with the essential features of the appropriation pattern contemplated by the reorganization plan.

Sincerely yours,

MAURICE H. STANS, *Director.*

Mrs. GRIFFITHS. Mr. Chairman, I would like to ask a question. Did the Bureau of the Budget turn down Mr. Holifield's bill for this Federal civil defense program because of a desire to accept this reorganization plan?

Or was it in any way motivated by that?

Mr. FINAN. Our last official statement on this, I believe, was in testimony last year by Mr. Merriam, where we expressed opposition to the establishment of an executive department at that time.

At that point this whole matter of the best way of organizing to carry out this program was still under very active consideration by the President, and we were not in position to take any position other than the negative one we took in opposition to the executive department.

Mrs. GRIFFITHS. Did you have your management people doing a survey at that time?

Mr. FINAN. At that point we did not have the active kind of a management survey under way that was subsequently initiated.

Mrs. GRIFFITHS. When did you start that?

Mr. FINAN. About the first of last December.

Mrs. GRIFFITHS. 1957?

Mr. FINAN. 1957, yes.

Mrs. GRIFFITHS. What did it cost you?

Mr. FINAN. About \$60,000.

Mrs. GRIFFITHS. How many people worked on it?

Mr. FINAN. Five or six.

Mrs. GRIFFITHS. Over how long a period of time?

Mr. FINAN. We are still working. Mr. Corson is here with us.

Mrs. GRIFFITHS. Can this committee anticipate that the Bureau of the Budget will continue to object to additional expenditures of funds for civil defense programs until this program is adopted or rejected, to any large or increased plans by the Federal civil defense program?

Mr. FINAN. Mrs. Griffiths, let me answer your question this way. I can't say at this point whether the President on the advice of the Bureau, among others, will or will not object to additional funds for civil defense. But I can say that the objection will not have its roots in the fact that this reorganization plan is pending before the Congress.

In other words, there will be no objection on that ground. If there is objection, it will be on other grounds.

Mrs. GRIFFITHS. Would it be prompted by this, anyhow? You won't put it on that ground—

Mr. FINAN. No, we will not defend an action having to do with the funding of these programs on the ground that this plan is pending here.

Mr. HOLIFIELD. Any further questions from the members? If not, the staff has a few technical questions which we wish to ask at this time, and then we will adjourn as quickly as possible. Mr. Roback.

Mr. ROBACK. Getting back to this question of delegation, the authority to delegate was conferred upon the President by this act, and the act itself was a delegation. The President was given authority to delegate to an officer. He was given authority to delegate to an officer, and in making such a delegation, the President was obligated to submit to the Congress a reorganization plan.

Is the procedure correct to that extent?

Mr. FINAN. Let me answer your question this way—

Mr. ROBACK. I haven't asked a question yet.

Mr. FINAN. I am sorry, I thought you had.

Mr. ROBACK. Do you agree with that procedure as a predicate to a question?

Mr. FINAN. You have asked me one question. The Reorganization Act merely defines as one of the several forms of reorganization authorized under that act an arrangement under which delegations can be made. Insofar as the President's power to delegate is concerned, it has roots that extend much wider than that, starting with the Constitution.

Mr. ROBACK. But under the Reorganization Act, if the President delegates authority as a part of the making of a reorganization plan, is he not obligated to come to the Congress with that plan?

Mr. FINAN. If the President is using the Reorganization Act to establish authority to delegate where it does not now exist, if he were using the Reorganization Act, obviously he would have to transmit a plan to the Congress; yes.

Mr. ROBACK. In other words, if this reorganization plan is enacted, the requirements of the basic act that delegations be made in connection with the reorganization plan is obviated, so that in the future any reorganization that the President wants to make in this field does not have to come to the Congress. Are we agreed on that?

Mr. FINAN. I do not agree with the way you stated it, Mr. Roback. I agree with the result. Once these functions are vested in the President, he can arrange for their performance by any agency or officer of the executive branch without coming back to the Congress; that's correct.

Mr. ROBACK. Then the Congress must understand that in approving this plan—if it does—that it is approving not a plan for civil defense reorganization, but is approving a plan for vesting a future unlimited delegation of authority in the President in this field. That is all it is doing under the plan.

Mr. FINAN. That isn't all that it is doing, but it is very definitely doing that; and there has never been any disposition to do anything except advertise that fact because we think that is one of the great benefits, considering the particular character of this program, that we will get out of this.

Mr. ROBACK. I didn't want the Congress to understand that it was passing on a form of reorganization of civil defense functions, which it is not in this plan.

Mr. FINAN. It is passing on a very major reorganization of civil defense functions.

Mr. ROBACK. There is nothing in the plan which says how the civil defense functions of this country are going to be organized.

Mr. FINAN. No, but the plan says where they will be vested by law. They will be vested in the President of the United States.

Mr. ROBACK. But the Congress is not passing on a plan which conveys to the Congress any information as to how the civil defense functions of the country will be organized in given agencies or in given functions. Is that not correct?

Mr. FINAN. Any more than the statement of the President about what he anticipates that he will do.

Mr. ROBACK. He is giving, you might say, the Executive intent; but he is not writing it into the plan.

Mr. FINAN. That's correct.

Mrs. GRIFFITHS. Who would we call to account for this, then? When we wanted to know why a program hasn't worked, who comes down here and tells us?

Mr. FINAN. The man to whom the President has delegated the function.

Mrs. GRIFFITHS. If he didn't delegate them, who would we call?

Mr. FINAN. If he didn't delegate them, then you would have a problem.

Mrs. GRIFFITHS. You would have no civil-defense program.

Mr. ROBACK. With regard to functions that are terminated in the course of the future like the temporary functions of the Defense Production Act, what happens to the agency in the distribution functions when the Defense Production Act expires?

Mr. FINAN. When the Defense Production Act expires, to the extent there are people involved in the performance of the function, obviously they go off the payroll. This has happened, as you know, under half a dozen titles of the Defense Production Act, which have been progressively terminated up to the present time. There is only a shred of the original Defense Production Act left.

Mr. ROBACK. What kind of functions will remain in the new office if it has delegated all those functions?

Mr. FINAN. To the extent the Defense Production Act is concerned, if the Defense Production Act terminates, there will be no more Defense Production Act functions anywhere, either in the President or in this Office.

Mr. ROBACK. Then it will be only advisory functions under the National Security Act and FCDA functions. Right?

Mr. FINAN. No, not in this whole complex. You have got the Communications Act of 1934 involved here; you have got the National Stockpile Act involved; you have got the National Disaster Act involved; the one provision of the Trade Agreements Act is involved; and I believe there are a number of other statutes that are involved here.

This is not merely the Defense Production Act and the Civil Defense Act at all.

Mr. ROBACK. In view of the fact this is a plan to transfer power, not a plan to set out an Agency, can you enlighten the committee in any way how this Agency will be set up?

Will, for example, it have the ODM Director and the FCDA Administrator in a certain relationship—No. 1 and No. 2? Will the operating agencies of the FCDA be maintained? Are any of those things spelled out?

Mr. FINAN. Obviously I am unable to comment on who the President may nominate to the Senate for any of the offices that are to be established under this arrangement.

Mr. HOLIFIELD. That wasn't the question. The question was the relation of a principal officer and a subordinate officer.

Mr. FINAN. If the question is, will the plan envision making civil defense functions the duties of the Deputy Administrator and some other functions the duties of the Director, the answer to that question is "No." We would not contemplate anything resembling a subordinate bureau or other entity that would be labeled "Civil Defense."

This will be a total civilian mobilization agency with the functions assigned to its head, and we would visualize a functional organization.

Again we cannot commit the new Director. He will have the same kind of flexibility over his internal organization that, say, Mr. Gray has now over ODM. Presumably he will be looking to us and others for advice.

I can only tell the committee again that the Bureau is impressed with the suggested pattern of organization for this new Agency that is embodied in the McKinsey report. We intend to commend that to the favorable attention of the new Director. But we obviously are unable to commit him to anything in advance.

Mr. ROBACK. In other words, the Congress is not going to have any concept of what this plan does in the civil-defense field. This is merely a permission to do whatever is decided to be done.

Mr. FINAN. That's correct, yes.

Mr. ROBACK. Is it not a fact that all this overlapping and duplication which the committee criticized and which was of concern to the Budget Bureau and the Executive Office was a matter of administration in the Executive Office? Why did the ODM Director have to compete with the FCDA Administrator? What law was needed to make him restrain himself from plowing the same ground?

Mr. FINAN. There wasn't any law to restrain him, but there was a law on the books that gave him very clear responsibilities that made this kind of a development inevitable.

With the benefit of the hindsight we all have now, it is quite easy to see what happened. But as I recall, the most recent statute we have on the books that is involved here was enacted in 1950, which was prehydrogen bombs, preballistic missiles and prefallout and preall kinds of things that we are now confronted with.

Mr. ROBACK. That argument falls to the ground, Mr. Finan, because there has never been any request by the administration to do anything about the basic legislation which is really prehydrogen bomb legislation. There has never been any proposal—

Mr. FINAN. The administration advanced a bill last year with respect to the civil-defense program which this committee handled; and, as I recall, the House enacted unanimously and the bill is now pending in the Senate.

Mr. HOLIFIELD. No, this was an amendment to the original FCDA Act. It was handled by Mr. Durham's subcommittee of the Armed Services Committee. It was not handled by this committee.

Mr. FINAN. I am sorry, sir.

Mr. HOLIFIELD. As the discussion on the floor will show, the suggestions that were made for amending the act were so minor in character that they did not merit opposition. This plan may go through in the same way—that it is so minor in its objective that no one will bother to oppose it.

Mr. FINAN. Mr. Chairman, I hope if the Congress sees fit—

Mr. RIEHLMAN. I would like to make a comment on that. Really, I am never very often in the opposite position from the chairman on this, but I just don't want to minimize this. I think it may on the surface appear to be a minor move, but I can see where it can be a significant move if administered properly by a new organization if the President sees the need—and I am sure he does at the present time—for a greater nonmilitary defense program in this country.

I think it has tremendous merit if it is properly handled. I would like that to be on the record.

I am discussing the present reorganization plan that is before us for consideration.

Mr. HOLIFIELD. I couldn't find it in my heart last year to go on the floor and oppose the amendments because they were so inconsequential in my opinion that they didn't deserve opposition, nor approbation either, as far as I was personally concerned. I did bring in the plan by saying possibly this might get through the same way.

Mr. RIEHLMAN. I go back to this point. I am very strongly in favor of the legislation that was introduced by every member on this subcommittee. Some of the provisions, of course, are covered in this reorganization plan—one, the elimination of duplication of ODM and FCDA.

I still feel very keenly about that type of legislation. I am looking forward to some dignity to this type of nonmilitary defense for our Nation, giving it some prestige in our Nation and in the minds of not alone the people but the legislators and Congress, because we haven't been too active in carrying out our responsibilities, even though maybe the administration hasn't.

Our committee has seen the need, and we have brought it to the attention of Congress as well as the administration. Congress hasn't seen fit any more than the administration has to step out with its forward foot to bring into being something that is drastic and which I think we can rightly say drastic in this field of nonmilitary defense with the conditions in the world the way they are today.

Certainly if we can't get the whole act that we are interested in, or bill that we have introduced, enacted into law, I am certainly willing to take a portion of it and see what effect it will have in the future.

Mr. ROBACK. Mr. Chairman, can we understand that the guidelines for the new organization are in the basic McKinsey committee report? Is that basically the organization we can anticipate?

Mr. FINAN. You can understand that the Budget Bureau will favorably commend that pattern of organization to the new Director.

Mr. ROBACK. I would suggest, Mr. Chairman, if the committee pleases, that the report be printed in the record for the edification of the members, because it has only a limited distribution at the present time.

Mr. RIEHLMAN. You mean both of these printed in the record?

Mr. ROBACK. If the committee wants to do that.

Mr. RIEHLMAN. I don't think it is too voluminous to have printed. We could have it as an appendix, or have it available for people to study. If counsel feels that it is of enough importance for people to study and it is going to be the pattern that will be suggested to follow, then I would have no objection to it being printed and made a part of the record.

Mr. ROBACK. That is the testimony that that is the basic pattern—the rationale for this plan.

Mr. HOLIFIELD. If there is no objection, I think we will have this printed as an appendix to the hearings.

(The documents referred to appear in the appendix as exhibit A.)

Mr. RIEHLMAN. Does that suit the counsel?

Mr. ROBACK. That is all right with me, fine.

Mr. HOLIFIELD. If there are no further questions at this time, we will announce that Mr. Hoegh and Mr. Gray will be before the committee tomorrow morning at 10 o'clock. Of course we will reserve the right to ask the Budget Bureau to come back on any matters which may come up as a result of subsequent testimony.

Mr. FINAN. We will be very happy to do that, Mr. Chairman. I would like to mention that if the committee is considering having Mr. Corson appear before it, he does have a trip to the west coast scheduled for sometime in the near future. I would like for you to be aware of his commitment in that respect in terms of his availability here.

Mr. HOLIFIELD. We have got our line of witnesses set up. Mr. Lipscomb had suggested that the McKinsey report be looked at by the committee. We would require his testimony.

Will Friday be all right?

Mr. CORSON. Mr. Chairman, I regret that I am scheduled to leave here tomorrow evening and will be back the following week.

Mr. HOLIFIELD. What time the following week?

Mr. CORSON. Thursday of the following week.

Mr. HOLIFIELD. Well, we will just have to leave indefinite your future appearance.

Mr. CORSON. I hope I don't inconvenience you by doing that, but I was scheduled to be there today.

Mr. HOLIFIELD. We couldn't hear you tomorrow, unless we had an afternoon meeting in addition to the morning meeting. What time do you leave tomorrow?

Mr. CORSON. Late tomorrow evening, 10:30.

(Discussion off the record.)

Mr. HOLIFIELD. The meeting stands adjourned until 10 a. m. tomorrow morning.

(Whereupon, at 12:30 p. m., the subcommittee recessed, to reconvene Wednesday morning, 10 a. m., May 7, 1958.)

CIVIL DEFENSE

Part II—Reorganization Plan No. 1 of 1958

WEDNESDAY, MAY 7, 1958

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON GOVERNMENT OPERATIONS
OF THE COMMITTEE ON MILITARY OPERATIONS,
Washington, D. C.

The subcommittee met in room 1501-B, New House Office Building, pursuant to adjournment, at 10 a. m., Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield, Griffiths, Riehlman, Lipscomb, and Minshall.

Also present: Representatives Hoffman and Johansen, of Michigan; Herbert Roback, staff administrator; Carey Brewer, senior defense specialist; and Robert McElroy, investigator.

Mr. HOLIFIELD. The subcommittee will be in order.

This morning we have before us as witnesses Gordon Gray, Director of the Office of Defense Mobilization; and the Federal Civil Defense Administrator, Gov. Leo Hoegh.

I understand you gentlemen have prepared statements, and whichever one of you wishes to precede the other may do so.

Mr. Gray?

Mr. GRAY. We are at the pleasure of the chairman.

Mr. HOLIFIELD. It is immaterial to me. Mr. Gray, why don't you proceed first. Apparently your organization is going to be the recipient of a great many other functions, including Federal civil defense.

Before you start your testimony, we would like to acknowledge the presence here this morning of our colleague from Michigan, Congressman Johansen. Congressman Johansen comes from the Battle Creek area and is greatly interested, of course, in the eventual outcome of this legislation.

I am sure, Congressman, you are welcome to sit in on the meeting today or any other time as far as that is concerned. We will extend to you the courtesy of questioning the witnesses if you wish. We will certainly explore any area that you are interested in as a Member of Congress.

STATEMENT OF HON. AUGUST E. JOHANSEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. JOHANSEN. Mr. Chairman, I very much appreciate the courtesy of the chairman and the members of the subcommittee. It so happens that I have another subcommittee meeting this morning that I

must be at. I did want to avail myself of the opportunity of indicating my great interest in this legislation. I want the record to show that we are very proud in Battle Creek to have the Federal Civil Defense Administration headquarters. We are very proud of the people who are associated with it and the way in which they have identified themselves with the community.

Naturally we have a great interest in the preservation of that facility in Battle Creek. We have had informal assurances from the Director of the Bureau of the Budget, from Governor Hoegh, and from others that there is no intention of making any appreciable transfer of personnel from Battle Creek or basic functions.

I am unfortunately not going to be able to stay to avail myself of the courteous offer you have made. I would be glad to have any assurances that may be given on that score, and any information that may be spelled out.

I would like to take this further liberty of saying that we have in the audience here the mayor of Battle Creek, Mayor Russell V. Wor-gess, former Mayor William V. Bailey, and Horace F. Conklin.

If you three gentlemen will just stand to be identified.

Mr. Conklin is the president of the Security National Bank. I think, Mr. Chairman, you met some or all of these gentlemen when you and Mr. Riehlman were in Battle Creek for a hearing. They are here simply to manifest their interest in Federal civil defense and in its continued operation in Battle Creek.

Mr. HOLIFIELD. We appreciate the attendance of your fellow townsmen and we make welcome to you the facilities of the committee and any questions that we can ask on your behalf or for completion of your own information, we will be glad to do so. You are welcome to stay as long as you like.

Mr. JOHANSEN. I appreciate it, Mr. Chairman, and I will ask to be excused.

Mr. HOLIFIELD. During the question period we will try to bring out some of the thoughts that you have given us and ask for testimony on those matters.

Mr. LIPSCOMB. Isn't this some sort of a special week in Michigan?

Mr. JOHANSEN. This is indeed Michigan Week. We are here in the interests of Michigan and in the interest of this program both, and we think that the two are identical.

Mr. LIPSCOMB. I just thought you might like to say something about that.

Mr. JOHANSEN. I appreciate that. And the gentleman knows we have sent out samples of our ready-to-eat cereals.

Mr. HOLIFIELD. Mr. Johansen, we are glad that you came this morning and we want you to know, of course, that we have a member of the subcommittee who is from Michigan. I assure you that she will be watching out for Michigan's interests.

Mr. JOHANSEN. May I say to the chairman that this committee is very fortunate to have the member from Michigan on it that it does have.

Mr. HOLIFIELD. Thank you very much.

Mr. Gray, you may proceed with your statement.

STATEMENT OF GORDON GRAY, DIRECTOR, OFFICE OF DEFENSE MOBILIZATION

Mr. GRAY. Mr. Chairman and members of the committee, I welcome the opportunity to discuss with you the President's Reorganization Plan No. 1 of 1958.

I would like, Mr. Chairman, if I may for a moment to digress from my prepared statement, to make an observation about your opening remarks. I am not sure whether they were on the record or not but, in the interests of absolute precision, I think the record should show that under the President's reorganization plan, both ODM and FCDA would be abolished and a new agency created, rather than a transfer of functions from one to the other of the existing agencies.

Mr. HOLIFIELD. I see. There will be a melding of the functions into the new organization?

Mr. GRAY. That's right.

Mr. HOLIFIELD. That is correct, I believe.

Mr. GRAY. As most of the members of this committee know, the responsibility of the Director of the Office of Defense Mobilization to the President is largely one of coordinating mobilization readiness activities. Reorganization Plan No. 3 of 1953 transferred to the new ODM all of the mobilization planning functions of the National Security Resources Board authorized by the National Security Act of 1947; the stockpiling functions formerly exercised by the Munitions Board of the Department of Defense; and the responsibilities assigned to the former ODM, including those carried out by the Defense Production Administration under the Defense Production Act of 1950, as amended.

Under these acts, or by authority of Executive order of the President assigning to me certain functions placed in him by statute, I am responsible for advising the President concerning the coordination of military and civilian mobilization; for coordinating, on behalf of the President, all mobilization activities of the executive branch; for developing and issuing policies and programs for defense mobilization; and for resolving interagency issues which would otherwise require the attention of the President.

In addition, the President by Executive Order 10638 delegated to the Director of ODM the authority to direct the release of materials from the strategic and critical materials stockpile in the event of enemy attack on the United States.

Also, by Executive Order 10705, the President vested in the Director, Office of Defense Mobilization, responsibility for the control of United States telecommunications in time of war. Because the wartime powers involved in stockpile materials and telecommunications are granted to the President by existing statutes, it was possible for him to centralize responsibility for the exercise of those powers.

You know, of course, that in addition, the Director of ODM has certain responsibilities under the Trade Agreements Extension Act, Internal Revenue Code, and the Agricultural Trade Development and Assistance Act.

Mr. Finan spoke to you yesterday regarding the general plan for creating the Office of Defense and Civilian Mobilization. I want to point out to you briefly this morning the sort of problems which have

arisen out of the respective responsibilities of the Office of Defense Mobilization and the Federal Civil Defense Administration so that you will see, as I have come to see during the nearly 14 months I have been Director of ODM, why reorganization in this field is imperative.

But first, by way of setting, I would like to touch quickly upon the problems resulting from technological changes which contribute increasingly to our difficulties.

We all recognize that scientific and technical progress constantly feeds on itself and so expands geometrically. It has been said, for example, that in our lifetime science has made more progress than in all of man's history up to that date.

Let me illustrate this with two familiar examples which have profound effects on nonmilitary defense, namely, the speed of travel and the power of weapons. Today man can fly 40 times faster than he could in 1910—less than 50 years ago. He can now shoot missiles even faster than he can fly. We are becoming so conditioned to these changes that they don't startle us any more.

The same thing is true of the power of weapons. Today's 20 megaton weapon is 1,000 times as powerful as the bomb which destroyed Hiroshima. And now fallout has added a new dimension—area. A single modern weapon can spread fatal radiation over hundreds of miles.

We must make every effort to keep pace with the growing power of destruction as we plan and prepare to survive it. At best, we require all the creative imagination we can muster as well as a lot of hard work.

We also require organizational mechanisms which, so far as possible, are directly responsive to the situation as we now see it, and not as we may have seen it 8 years ago when the Defense Production Act and Federal Civil Defense Act were enacted.

Eight years is just a moment in history, but in terms of the changes that have been wrought in weapons technology since the beginning of the thermonuclear age, it seems a very long time indeed.

It may well be that the thermonuclear age will bring many more radical changes over the next several decades than any of us in the room can now envision. But for the present, we need to make the organizational changes necessary and we then need to build into the new organization a greater capacity for change.

It has been said, with respect to this reorganization plan, that this is the first time that it has been proposed that such an agency be placed under the direct control of the President in peacetime. To that I can only respond that this is the first thermonuclear age that we have been in.

And when we find it necessary to spend \$40 billion a year for military purposes, it certainly isn't peacetime in any historical sense. The problems we face are unparalleled; the solutions must be responsive to the unparalleled problems, not limited to traditional ways of doing things.

Let's look at the way in which the program of the Office of Defense Mobilization has changed in the last 8 years. During the Korean war, as was the case during World War II, we thought of mobilization as involving the rapid conversion of productive capacity from peacetime to wartime production, supplemented by stockpiles of strategic and critical materials and equipment.

Based on that concept, ODM carried out a great many expansion programs to build up a mobilization base which could be quickly converted to war production. At that time its planning and programs were directed toward a 5-year war.

But as we came into the nuclear age, the Government moved away from that concept toward one of a shorter, more devastating war which required measures designed to increase our readiness to fight without a long conversion period. We began to talk about a mobilization base that was all ready to produce weapons, as contrasted with a base that was ready to be converted; about plants with "hot," "warm," and "standby" lines for military production. We also became more concerned with nonmilitary defense, with dispersion, continuity of government, and the reduction of vulnerability.

Recently the concept of military forces in being has been more widely accepted, the idea being that we would probably have to fight the next war pretty much with the weapons that we have on hand. On the civilian side, this means mobilization readiness in being.

Today we believe that if we should ever be attacked, we probably would not have sufficient warning to enable any substantial preparations to be made before the attack. This means that we must prepare in advance insofar as we are able.

We must have material things in being; civil defense equipment, supplies, alternate operating sites, and communications systems; and we must also have nonmaterial things in being: Chains of command, standby procedures, and orders and training at all levels so that every Government employee and every citizen can do his part for national survival.

Accordingly, our major efforts today in ODM are directed toward development of a readiness capability to meet a direct attack on the United States. The capabilities of the Soviet Union are such, however, that we cannot predict the location or magnitude of any potential conflict.

Certain of the mobilization readiness measures are directed toward a limited war situation. Yet, even here, we recognize that even a limited war would increase the threat of direct attack and might therefore necessitate full and immediate national mobilization.

Such a situation would require that the Nation be geared to move rapidly to a wartime footing. This would require not only the mobilization of the Nation in a fraction of the time we took in World War II and Korea, but would also require our readiness to take protective measures in preparation for possible attack.

In other words, when we talk about mobilization from here on out, we are talking about nonmilitary defense. We cannot have one without the other.

Now, to be more specific, there are several areas in which we and FCDA have overlaps and duplications under existing division of basic authorities between the two agencies. This has created difficulties which we have not been able to overcome despite the efforts of both staffs.

Some areas involved, for example, are developing and testing emergency plans, planning for the mobilization and utilization of resources, planning for the continuity of Government, and coordinating the defense activities of other Federal agencies.

In the last couple of years, ODM, under its basic authorities, has devoted a great deal of attention to developing mobilization readiness plans. We have prepared planning assumptions and top-level action steps for the mobilization of key resources, and are working continuously with the resources agencies to develop their own implementing plans. FCDA has been doing the same thing to carry out its legislative mandate with respect to civil defense.

We have cooperated successfully in sponsoring the annual Operations Alert, which test these preparedness measures, but these exercises also have served to reveal a number of weaknesses and conflicts resulting from dual command.

In short, with two agencies of the executive branch having mandates requiring them to prepare comprehensive planning assumptions and nonmilitary defense plans, unnecessary overlaps, duplication of effort, and inconsistencies cannot be eliminated, and gaps in nonmilitary defense plans and programs inevitably result.

Perhaps the greatest area of difficulty has been in planning for the mobilization and utilization of resources. While this is a central responsibility of ODM, FCDA also has very broad responsibility and powers in this field in a civil defense emergency.

The result has been confusion among Federal departments and agencies having resource mobilization responsibilities, as well as among States and their local governments.

This situation was apparent to me last year when, not long after being appointed Director of ODM, I participated in the annual Operation Alert exercise. I found a readiness concept based upon three chains of command under the ODM, FCDA and Department of Defense. ODM headed the middle chain—resources control—and it turned out to be largely that of adjudicator of conflicting claims for defense and civil defense—the two operating chains.

This was the planning concept under the division of basic responsibilities which was first reported to this committee by the former Director of ODM in early 1956. Operation Alert 1957 demonstrated to my satisfaction that this concept would not work.

FCDA has the authority, postattack, to requisition supplies and materials, and to delegate its requisitioning authority. On the other hand, ODM has broad authority to determine priorities and allocations of materials and facilities for national defense purposes.

Accordingly, under attack conditions, these authorities are bound to collide—as they did during Operation Alert. Under such attack conditions, resources and facilities could be preempted by any one of the three chains of command, without due regard to the requirements of the others, before reasoned analysis could measure their requirements. The result could well be that essential military or survival operations would be endangered.

One of the ways in which an effort has been made to sort out the responsibilities of ODM and FCDA was by trying to define separate time periods after an attack. The concept was that there would be a survival period in which FCDA would be in charge, followed by a recovery period in which ODM would be in charge.

It does not take a very hard look at this concept to see that it doesn't make very much sense. After an attack there would be damaged areas, areas subject to residual radiation, and areas which had not been directly affected by the attack. But these latter areas might be paralyzed by the destruction of resources in other parts of the country; for example, damage to communications, transportation, and productive facilities. The nationwide effects of the application of stringent controls in the damaged areas would further complicate this problem.

We must be prepared to deal with the situation in all of these areas with a single, unified, and continuing effort. Furthermore, in the event of repeated attacks, the survival period could extend for many months or years. The actions taken during the survival period to use up resources would profoundly affect our ability to recover later.

In short, we have found that it is impossible to compartmentalize civil defense and defense mobilization. It is impossible to separate preattack measures for the protection of the people from measures for the protection of facilities to supply the things needed after attack. It is equally impossible to separate postattack measures for immediate survival from the long-run measures needed for national recovery.

Following Operation Alert 1957, as I attempted to secure key executives for regional resources directing jobs in the event of mobilization, I was faced constantly with the question "But who is in charge? To whom do I report: the ODM, the regional civil defense director, or the Governor?"

In my view, this obviously confused situation can only be cured by establishing a single organization responsible for both defense mobilization and civilian mobilization.

Another area of conflict has been with respect to planning for the continuity of Government. After a good deal of early overlap, a division of responsibilities was agreed upon in 1956 under which ODM would continue to coordinate Federal continuity of Government activities, while FCDA would accept the responsibility for assisting State and local governments in this program.

This division of responsibility has brought some order out of a previously chaotic situation, but there is still much to be done in coordinating the two similar programs. It is very difficult to insure among all levels of government the effective, integrated working relationships that must exist in an emergency.

For example, relocation sites of Federal and State agencies may be so situated as to create conflicting communications problems, because no single agency is responsible for insuring that compatible locations are chosen by all levels of government.

Finally, there are many overlaps involved in the efforts of ODM and FCDA each to coordinate the activities of other Federal agencies which have responsibilities in the nonmilitary defense field. Both ODM and FCDA have made delegations to a number of the same agencies, such as Agriculture, Interior, Commerce, Labor, and the

Housing and Home Finance Agency. A number of agency officials have reported to your committee in the past about the difficulties involved in these overlapping delegations.

Past efforts to sort out the roles of the two agencies have produced the document on the division of basic responsibilities, which I referred to earlier. This paper was the product of a great deal of study and consultation between the staffs of both agencies.

Governor Hoegh and I also set up a number of new joint task forces in the various resource areas to attempt to work out a reconciliation of our difficulties. A lot of fine work was done by the staffs of both agencies, but I must confess that the results were not too encouraging.

The powers and functions of the proposed new organization have been described to you by Mr. Finan, the Assistant Director of the Bureau of the Budget. I should like, however, to speak on one point that I think is particularly important, and that is the necessity that the Office of Defense and Civilian Mobilization be set up in the Executive Office of the President.

I feel that this is so because the responsibilities for mobilization readiness, to the greatest possible extent, must be spread throughout the Federal Government and downward into the State and local governments. I think we must get people to look on mobilization readiness as simply an extra part of their own regular day-to-day jobs.

The Agriculture Department people throughout the country must plan for supplying food in an emergency. Public Health Service people must plan for medical care. People in the housing agencies must plan for housing, and so on.

These activities must be carried out by the people who have the technical competence and who exist in large enough numbers to make the activities meaningful.

The role of the Office of Defense and Civilian Mobilization, at best, will be one of direction, coordination, and stimulation of all of the many efforts throughout the country, which go to make up mobilization readiness. This direction, coordination, and stimulation can best be done by an agency which is as close to the President as possible.

In conclusion, then, let me say that the Federal Government, in my opinion, cannot afford to continue to have two sets of coordinating agencies concerned with preparedness for nuclear attack. The current situation has created confusion among the Federal departments and agencies.

If allowed to continue, it will create an even greater confusion among the States and the Federal agencies, as Federal mobilization plans reach the stage where they can be made available not only to Federal field officials, but to State and local officials.

The answer to this confusion is to unify the present authorities and responsibilities in the hands of the President and to allow him, through an Executive Office agency, to provide for a unified direction of all of these activities. This solution will not, of itself, insure our reaching an adequate state of mobilization readiness.

It will, however, clear the way for our doing so. In the judgment of those of us who have worked most intensively in this field, the President's reorganization plan represents the best approach toward that objective.

To sum up: The President's recommendation recognizes that both ODM's and FCDA's administrative organizations for providing mobilization for defense and civilian preparedness for survival are outmoded in this day of such rapid progress in science and technology. The gears of the two existing organizations need to be meshed to get the job well done with maximum dispatch and minimum expense.

In my opinion, the quickest and most effective way to get a full measure of coordination and direction so needed to meet the challenge of today in national mobilization is for Congress to approve the President's Reorganization Plan No. 1 which is now before you.

Finally, as we recognize the importance of total national survival in the nuclear-missile age, we must not minimize the importance of production readiness, resource allocation, critical materials stockpiling, civil defense emergency relief and welfare planning, emergency public works restoration, and a host of similar vital activities.

I believe the importance of national survival to have greatly expanded each of these activities and demanded that they be considered in relation to the whole. I believe the President's Reorganization Plan No. 1 makes possible organized attention to this total problem.

That concludes my prepared statement, Mr. Chairman.

Mr. HOLIFIELD. Thank you, Mr. Gray.

Mrs. Griffiths, do you have any questions?

Mrs. GRIFFITHS. No.

Mr. RIEHLMAN. Mr. Chairman, I am sure you have some prepared questions.

Mr. HOLIFIELD. You go right ahead.

Mr. RIEHLMAN. I will defer mine until you have finished those.

Mr. HOLIFIELD. Mr. Gray, we had Mr. Finan before us yesterday. We went into some detail in regard to the plan. I believe the members of the subcommittee feel after our extensive study of this program, while this plan has certain meritorious objectives and I would say also certain opportunities for the elimination of confusion between the overlapping and confusing functions of the two agencies at this time, yet it does not go far enough to insure that we will have an effective civilian defense.

We find quite a wide permanent reorganization power being transferred to the President in this field, and some of us fear at least that there will be thereby created an area of Executive privilege which will in effect work against the Congress being able to have accountability from the Administrator of these agencies.

The claiming of Executive privilege has become quite prevalent on the part of officers and executives in the President's department, based on constitutional grounds, I submit. Nevertheless, it places some of these people outside of the scope of congressional interrogation.

Also the allocation of moneys in this plan apparently is a blank check to the President to distribute it wherever he wants to. As Mr. Finan testified yesterday, it has not been definitely decided whether the funds will go to the Director of the new agency, or whether appropriations will be made directly to the President for his allocation.

So we find some encouraging things in the plan and we find some things that bother us.

In your statement you mention the tremendous changes that have taken place in weapon technology in the past 8 years. This committee

for several years now has been calling those matters to the attention of the executive branch. We have made a series of recommendations which apparently haven't been given a great deal of attention by the executive branch. At least they haven't been put into effect in the program.

We, too, thought there should be a basic responsibility for civil defense in the Federal Government, but we find that this plan doesn't provide for that. It merely provides for a transfer of present confusing functions into one agency, but it does not provide for the Federal Government accepting the basic responsibility for a national plan.

Mr. RIEHLMAN. I wonder, Mr. Chairman, could we have a statement from Mr. Gray in response to that question?

Mr. HOLIFIELD. Yes, I am making the statement from the standpoint of obtaining a comment from Mr. Gray.

Mr. GRAY. Mr. Chairman, you adverted to three things. May I comment on each of the three very briefly?

Mr. HOLIFIELD. Surely.

Mr. GRAY. I was interested in your comment on this plan of creating a situation of Executive privilege. Respectfully, I would disagree with your conclusion, or at least your observation. At the present time the Office of Defense Mobilization is in the Executive Office of the President.

Mr. HOLIFIELD. I realize that, and it is in a privileged position as we found out when we tried to interrogate Dr. Flemming when he occupied that position.

You say in your own statement, page 2—

I am responsible for advising the President concerning the coordination of the military and civilian mobilization.

and as adviser to the President you automatically are placed in a status of being able to claim Executive privilege.

Mr. GRAY. In a strictly advisory capacity, of course, that is so. But I can only describe to you my experience as Director of ODM since I have been in this position. I couldn't, offhand, tell you how many times I have been interrogated by the various committees of the Congress, but I assure you it has been a great many times, across the whole range of such responsibilities as I have.

So, the fact of the presence of an officer in the Executive Office of the President does not make him immune, and, in my judgment, should not make him immune, from responding to congressional interest with respect to his responsibilities.

So, I think this should not be a matter of any real concern to the committee. I am only speaking now of my own experience in this job. I think there always is the possibility of a question of executive privilege arising as far as an executive agency is concerned. But this could arise in a regular department of the Government, and has in the past. But it would not arise, I think, because of the officer concerned being in the Executive Office of the President. This is my opinion.

Mr. HOLIFIELD. I can only go from my experience, also, in dealing with Admiral Strauss in the Atomic Energy Commission.

Mr. GRAY. He is not in the Executive Office of the President, Mr. Chairman.

Mr. HOLIFIELD. But he is adviser to the President on atomic-energy matters.

Mr. GRAY. I think he has a title of special assistant to the President for atomic-energy matters. But there is no such provision here in this case.

Mr. HOLIFIELD. The title isn't here. But, certainly, the functions which you outline here as being the principal adviser to the President in these matters might very well put you in that position.

I recall in one instance in the 5-man Atomic Energy Commission there was a vote of 3 to 2 on a certain matter, and Mr. Strauss was on the losing end of the vote of the Commission.

So he immediately takes off his hat as Chairman and goes to the President with his hat as Presidential adviser and gets the President to sustain the position of Mr. Strauss and the other member who were in the minority, and thereby the commission form of government was completely nullified.

So, there is one of the things that strikes me.

Mr. GRAY. Let me just say this, Mr. Chairman: I am not sure what the Federal Civil Defense Act says on this point, if anything.

Mr. HOLIFIELD. I think it is the Office of Defense Mobilization that has the language in it in title I, section 103 (b). I am assuming that that will be carried over into the new agency.

Mr. GRAY. I am assuming so. I was about to say, with your permission, I don't know what the Federal Civil Defense Act says, but, as a practical matter, it is certainly true now, Governor Hoegh is the principal civil-defense adviser to the President, without question.

Mr. HOLIFIELD. But he has statutory duties, and your duties in ODM are principally, I believe, by Executive order and not by statute; is that not true?

Mr. GRAY. There are some by Executive order and some by statute, but all resting on statutory authority.

Mr. HOLIFIELD. Of course, the Executive orders rest upon the constitutional power of the President to issue the orders. I recognize that. Assuming that they are made within the bounds of the purpose of the office. But the purpose of the office is not only outlined by statute; it is outlined by Executive order—I am speaking more of ODM now than I am of FCDA. We don't need to dwell on that point.

Mr. GRAY. The second point you raise is allocation of moneys, and I trust you understand I cannot speak to that point.

Mr. HOLIFIELD. Yes.

Mr. GRAY. The third one—I have forgotten where we were. I was trying to think of these three things, the one that Mr. Riehlman wanted me to comment on.

Mr. RIEHLMAN. You talked of three points, Mr. Chairman.

Mr. HOLIFIELD. Oh, yes; I recall now. I said that, notwithstanding the study which this committee has made, the recommendations we have made, we find that there is no change incorporated in this plan which would indicate to us that it is going to be any more than a planning organization and a delegating organization. Even the operating functions of FCDA will now become subject to the President's delegation, and, consequently, to the degree of emphasis he wishes to put upon each one of these functions; even the statutory functions will be modified.

So, we look upon this, as I said, as not going into the field of operations to really give us an effective civilian defense. It may be a feeble move in the direction of eliminating some confusion and delegating power, but the basic theory in the President's message seemed to me that, after a study was made, recommendations would come to him for further expansion of delegations.

We have seen this operation resting as it does upon, you might say, a nonoperating agency and a planning and a thinking agency and a talking agency, but not a doing agency. We have seen this now for several years. In the meantime, millions of dollars have been spent in what we consider a pretty futile effort.

Mr. GRAY. May I comment on those observations? On the question of whether there should be delegations in whatever organization structure we have for these purposes, Mr. Chairman, the Congress has recognized the necessity for delegations and consistently provided that.

Mr. HOLIFIELD. I recognize that. This is in the act of 1950, which you have already admitted in your testimony has become obsolete. Yet we have had nothing to change it. It hasn't worked.

Mr. GRAY. I didn't intend to suggest that the wisdom of delegation is necessarily obsolete. I think in this whole program there must be delegations, however this thing is set up.

But, as far as an interest in and responsibility for civilian defense is concerned, I think it is true, and I am getting out of my field, because I am not a legislative lawyer—but I think it is true that the reorganization plan which the President has submitted would not enlarge the authorities of the executive branch with respect to this whole general field, if I can speak of it as a package.

Mr. HOLIFIELD. This is true.

Mr. GRAY. Nor would it diminish, as far as the responsibility of the Federal Government in Federal civil defense matters is concerned. I am getting into Governor Hoegh's field a little bit. I believe the House has passed a bill which specifically makes a change in the old situation, or would make a change if the Senate approves the bill and the President signs it—the old situation being that civil defense was considered a matter primarily for the States and localities.

So this, of course, is an expression of the will of Congress, or would be if adopted, that the Federal Government does have the responsibility. It is my view that rather, as you characterized this as being a feeble attempt simply to eliminate some duplications, it is my view that the Reorganization Plan No. 1, if it becomes law, would be a basis for vigorous and unified effort in this whole field which involves now, as I tried to say in my statement, the problem of avoiding compartmentalization of civil defense here and resource allocation here and other activities some other place.

So I do not think that the effect of the bill would be to diminish the Federal Government's interest and responsibility in civil defense. On the other hand, it is my view that it would make it more effective.

Mr. HOLIFIELD. I appreciate that this is the attempt. My question is not to criticize it, but to point out some of the factors that are involved which seem to us not to go far enough.

I realize you cannot increase the functions of the reorganization plan. This is in accordance with the Reorganization Act. But we find in the President's message that apparently there is no intent to

centralize into an operating agency—even after the plan becomes effective—what we think are certain basic functions which need to be accomplished if we are to have an effective defense.

You spoke of the original language which places primary responsibility upon the States. The new language in the bill places joint responsibility. The exchange of primary for joint is a play on words. That is all. It is words, because joint responsibility could be 99 percent State and 1 percent Federal, or it could be 99 percent Federal and 1 percent State.

Primary responsibility, if you want to analyze it, could be 51 percent Federal or State, and so forth. So we are playing with words. But in the meantime the American people are unprotected. This is the thing that worries the members of this committee.

Mr. GRAY. May I say, Mr. Chairman, as we have agreed, I think, a reorganization could not enlarge the authorities, by the same token it is clear, I think, that the President may not omit the performance or the responsibility for effecting the performance of the statutory responsibilities.

Mr. HOLIFIELD. Have you studied H. R. 2125 and the companion bills?

Mr. GRAY. I don't know those numbers, Mr. Chairman.

Mr. HOLIFIELD. That is the bill that was introduced by several of the members of this committee back in 1957. We sought at that time to bring together and bring some order out of the confusion. That was quite a while ago. We sought in section 302 the transfer of the Office of Defense Mobilization civil defense functions into the FCDA—in other words, to take those conflicting functions of delegations in the civil defense field out of the ODM and place them in the FCDA.

That was one of the things that we sought to do. We sought to set up and give to a central agency, a unified agency, a more important position. We said a Cabinet position. We recognized that this plan takes a step upward as far as the overall problem of mobilization is concerned. It does not take it quite as far as a department, but it is a step upward.

But we brought forth in this bill the methods that we thought from a legislative standpoint would give a real significance to this effort and would give you the tool to do the job.

So you have studied the bill and studied the recommendations of this committee, the 13 recommendations. I think you know what I am talking about when I say this is a very feeble step in comparison to what this committee thought was a real step forward to get an effective civilian defense.

What position do you have on H. R. 2125? Have you studied it at all?

Mr. GRAY. I am generally familiar with the bill. I haven't studied it recently, Mr. Chairman. Of course I am here to support the President's Reorganization Plan No. 1.

Mr. HOLIFIELD. You wouldn't feel free to comment upon the program that might be developed within your planning capacity after this reorganization plan becomes effective?

Mr. GRAY. I would not feel free, Mr. Chairman, to comment on what a new Director of the Office of Defense and Civilian Mobilization would do, nor how he would proceed. There has been no deter-

mination as to who that officer would be. I think you can understand that I could not speak as to what his plans might be.

Mr. HOLIFIELD. Then the committee must move forward in the dark as far as this plan is concerned and take the positions of the plan on trust and confidence that out of the melding of these two organizations there will eventually come a workable plan.

Mr. GRAY. I believe that this will be the result of the reorganization plan; yes, sir.

Mr. HOLIFIELD. Then how about the McKinsey report? You had a study made by the McKinsey people. You spent about \$60,000 on it. What part of that plan has received favor by either the Federal Civil Defense Administration or the ODM? Can you tell us that?

Apparently it is upon their study that the plan has been presented. Can this committee have assurance that the rest of their recommendations will be embodied in any kind of a specific plan, or are we to consider that this will be put on a shelf and that some other type of action may be taken?

Mr. GRAY. As far as the McKinsey & Co. study was concerned, Mr. Chairman, as you know, this was a study made under the auspices of and at the request of the Bureau of the Budget. In the course of their study, the people who worked on that, of course, consulted with us, and I suppose all other interested agencies in Government, and came up with a report to the Director of the Budget, which I think has been furnished your committee.

As to questions of future organization and further use that is to be made of the McKinsey plan, I must say to you that the appropriate witness on this point would be a Bureau of the Budget witness.

Mr. RIEHLMAN. Mr. Chairman, I know that Mr. Gray in his statement has probably covered pretty well his views on the plan; but I am in the same position as you are. I do feel that someone either from your office or FCDA or the Bureau of the Budget could outline in some detail what you expect to accomplish and how this program is going to be expanded within the framework that it can expand to be a more effective organization.

We are talking pretty nearly in general terms. I am not sure, Mr. Chairman, whether Mr. Hoegh as Administrator of FCDA is going to testify—

Mr. HOLIFIELD. He is going to follow Mr. Gray.

Mr. RIEHLMAN. I feel that someone in some one of the departments should give us a little bit more of an idea as to really and truly what is going to be expected. I feel the same as you do about that. I have confidence in you gentlemen; I am sure of that. But I don't think that our committee, as the chairman has said, wants to barge into this reorganization plan, even though we might feel very kindly toward it and feel that we were making a step forward, unless we have more specific information as to what is going to be accomplished.

Our committee has made a long-term study of this program. We felt that we had issued strong and constructive reports and recommendations. We went so far as to introduce legislation that I am sure would go a long, long way—probably further, Mr. Chairman, than Congress would even accept at this time; maybe they would or maybe they wouldn't, that is a question. But this is a portion of what we have been thinking about certainly.

I can only reiterate this, that I have felt kindly toward the program. I felt kindly toward this reorganization plan. Maybe it is a portion of what we are looking for and we might better accept it and start forward.

But before being completely enthusiastic about it, I feel that someone should try to give us, in a little bit more detail and specifics, exactly what we intend to accomplish. I hope that that may be possible, Mr. Chairman, when we get to the Director of FCDA, Mr. Hoegh. Maybe he can give us some more. If he can't, we will have to accept what has been given to us. But I just think it is not sufficient at least for me to be enthusiastic and convinced that this is going to do a portion, at least, of what we have been hoping we might do through a reorganization of FCDA and ODM in the civil-defense field.

Mr. HOLIFIELD. We feel that you gentlemen are undoubtedly the ones that have looked into this matter. You are really the planning agency—or your successors will be. I am not speaking of you as an individual. In a way I am speaking of you as an individual, because you undoubtedly have individually participated in conferences on this matter and plans as to the future.

We feel that you should be able to tell us something more specific than just that confusion and duplication are going to be eliminated, and that delegation is going to be expanded; and that you would be able to give us something direct.

For instance, tell us what your relationship is going to be, what organizational pattern you are going to anticipate for the new Office of Civil Defense and Mobilization, what your relationship is going to be with the military.

We know there is a conflict there between the military and your office in meeting these problems. As a matter of fact, we have just been presented with a quite elaborate plan of the Army to take over, on the assumption that there will be no civil-defense agency of any effectiveness.

Do you know about that?

Mr. GRAY. No, sir; I do not.

Mr. HOLIFIELD. These are things that should come to your attention Governor Hoegh. Do you know about this study of the Army, that they are going to take over because there is no Federal civil defense?

Mr. HOEGH. Would you like to have me answer it at this time?

Mr. HOLIFIELD. Yes. You may have a seat up here. Maybe you can help Mr. Gray on some of these questions. They may be more in your field.

STATEMENT OF LEO A. HOEGH, ADMINISTRATOR, FEDERAL CIVIL DEFENSE ADMINISTRATION

Mr. HOEGH. I believe, Mr. Chairman, that study is being made more with a view in mind of determining how the military could support the civilian effort, and also how the civilians could support the military effort in case there is a nuclear attack.

Mr. ROBACK. Do you know the assumption of plan B in this Army program? Let me precede that by this question: Did you attend a meeting of the Association of State and Territorial Civil Defense Directors at the Sheraton Park Hotel?

Mr. HOEGH. Yes, sir.

Mr. ROBACK. Which Gen. W. M. Wyman, commanding general of the United States Continental Army Command addressed?

Mr. HOEGH. Yes, sir.

Mr. ROBACK. He outlined two plan assumptions—one of which was that so-called plan B, under case B, would see the military assume a full responsibility for the establishment of law and order in the protection of life and property when civil authorities are incapable of functioning.

The question here is, if this agency doesn't establish any effective civil control authority, then the implications of case B are that you would have a military control over the civil defense program.

Mr. HOEGH. Yes. Of course, however, I want to quickly point out that we are trying to strengthen the capability of all governments at all levels to be able to operate during an emergency. We hope by that program that it will never be necessary to call upon the military to take over the civilian effort.

We feel that if governments at all levels have the capacity to have leadership in that community, leadership in the State, by establishing lines of succession 5 or 6 deep so that we never lose the leadership; secondly, if they preserve essential records that are necessary for carrying out the functions of government in their communities or in the State; and third, if they have alternate sites from which they can continue to exert their leadership and control; and fourth, if they marshal or make full use of all the resources, the facilities, the personnel of governments at all levels, then we will always have a capability of the civilians controlling their respective communities, States, and the Nation.

Now, we feel this, that it is proper for the military to plan to be prepared to support this effort. I hope by our program and by the development of this capacity of governments at all levels to operate during any kind of an emergency that it would never be necessary to call upon the military to take over and to actually control the civilian populace.

Mr. ROBACK. The point of the chairman's question is that it goes to what this new agency—which is, after all, a civil defense planning agency presumably for the Nation—proposes to do or what its relationship is to these military plans which are going ahead.

The statement of General Wyman is here that, at the outset:

It is getting late in the game and we are long overdue, a complete meeting of the minds. The pressures of the nuclear age will not be eased through the use of rose-colored glasses or verbal legerdemain.

Mr. HOLIFIELD. Today Mr. Gray said:

We believe if we should ever be attacked we probably would not have sufficient warning to enable any substantial preparations to be made before the attack. This means we must prepare in advance insofar as we are able. We must have material things in being.

And he goes on and he outlines these things.

But these things are not in-being at this time. Your civil defense equipment is not in-being; your supplies are not in-being and properly allocated and safely stored; and your communications systems are not in existence in the form that would be needed in case of the disruption of our conventional types.

So we find ourselves in this unprepared situation, and yet we have no realistic program to which this committee might point and take this plan as a step, knowing that after the step is taken that it will not just be another futile step, a "think" organization in the place of a "do" organization.

Mr. RIEHLMAN. Rather than get away from the subject, that is what I was driving at, Mr. Chairman, with Mr. Gray. I wonder if Mr. Hoegh can give us his thinking or envisage how this program that lies before us is going to cope with the situation such as the chairman has outlined.

Mr. HOEGH. Would you prefer to have me do that at this time or may I proceed with my prepared statement?

Mr. HOLIFIELD. I think maybe it would be orderly for him to have a chance to present his statement. He may answer some of these in his prepared statement.

Mr. HOEGH. I think some of the questions are answered in this statement.

Mr. RIEHLMAN. Fine.

Mr. GRAY. Mr. Chairman, may I comment on this question of the role of the Army and the question of decisions that have to be made? First of all, I would like to reiterate that, as I think we agree, this reorganization plan in no way relieves any officer of Government, including the President of the United States, from his statutory responsibilities.

As Commander in Chief, and as President of the United States, of course he would retain the power of decision as to the question of who is in charge in an emergency. This is a responsibility he could not or would not wish to escape.

If the suggestion is that the Army is just planning to take over, I do not believe this to be the fact; and in any event, this certainly is a matter which the President can control.

Mr. ROBACK. The point of the question, Mr. Gray, is whether you are acquainted with the Army planning, which obviously is important to the country.

Mr. GRAY. I have not seen their plans in detail, no.

Mr. ROBACK. Have you received a report from your Advisory Committee on Survival Supplies known as the Pettibone report, submitted on January 28, 1958, called Stockpiling for Defense in the Nuclear Age? Have you seen that report?

Mr. GRAY. I released it, yes.

Mr. ROBACK. That report states that the Government is spending \$40 billion on military matters, and \$7,350 million on strategic and critical materials, and it says: "The time has come to take action for human survival, relief and rehabilitation in the event of nuclear attack"—do you subscribe to that observation?

Mr. GRAY. Yes. The time has come for us to address ourselves seriously to this problem.

Mr. ROBACK. Does this plan address itself seriously to that problem?

Mr. GRAY. No, there is nothing which relates to stockpiling in the President's reorganization plan.

Mr. HOLIFIELD. You spoke in your statement about meshing the gears of these two agencies. The committee agrees they should be

meshed. You said: "The gears of the two existing organizations need to be meshed to get the job well done with maximum dispatch."

We agree with you on that. But we are going beyond that and suggesting the motor needs some gasoline to turn the gears. It is the type of motor you are going to attach to the gears that we are interested in, and we have been interested in for many years because gears without motivation are pretty useless.

Mr. GRAY. I have to agree with that.

Mr. HOLIFIELD. And unmeshed gears are even more useless in the long-term analysis. Whether they are meshed or unmeshed doesn't make a great deal of difference if we don't have some power behind them to cause them to revolve.

Mrs. GRIFFITHS. You have pointed out here, Mr. Gray, on page 10 exactly what you think this agency is going to do. You point out that you think you must get people to look upon mobilization readiness simply as an extra part of their own regular day-to-day jobs, and that the role of the Office of Defense and Civil Mobilization at best would be one of direction, coordination, and stimulation of all the efforts throughout the country.

This direction and stimulation can best be done by an agency as close to the President as possible.

May I ask you if you know of any plans of the President to notify the country by television or by a speech of any kind as to exactly what would happen in case of a nuclear attack?

Mr. GRAY. You mean that an attack has occurred?

Mrs. GRIFFITHS. No. Has the President made any plans to explain to the people what the dropping of a 20-megaton bomb would do?

Mr. GRAY. I believe Governor Hoegh is in a better position to respond to this matter of informing the public from the civil defense point of view than I am.

Mrs. GRIFFITHS. Then may I ask you a further question. Is there any food now any place in the Nation that would be protected from blast or radioactive fallout that would be sufficient for instance to feed 1,000 civilians.

Mr. GRAY. From blast—

Mrs. GRIFFITHS. And radioactive fallout.

Mr. GRAY. Again Governor Hoegh is in a better position to answer this. I would venture a guess if you are talking about blast from a direct hit from a large weapon, I would question whether there is any such.

Mrs. GRIFFITHS. From radioactive fallout?

Mr. GRAY. I know that some of the States have taken steps to provide supplies of stocks, but I don't have sufficient precise knowledge to respond to the question adequately.

Governor Hoegh can answer that.

Mrs. GRIFFITHS. The Federal Government hasn't contemplated spending any money to protect food for anyone; is that right?

Mr. GRAY. The Federal Civil Defense Administration has now, as you know, some stockpiles of essential items. I myself don't know what provisions have been made for their protection.

Mrs. GRIFFITHS. Are you protecting metals, strategic materials, metals and other such things? Is that your job?

Mr. GRAY. It is really the General Services Administration's job to manage and handle the stockpile; but under the statute the policy responsibility for the acquisition and retention of the stockpile is an ODM responsibility. I believe that in answer to your question, by and large, however, the strategic and critical stockpile materials are not in protected sites.

Mrs. GRIFFITHS. Are they in usable places?

Mr. GRAY. In the program an effort has been made to store these stockpiled materials as near as possible to the points where they would be used without complicating and compounding the target difficulty. In other words, an effort has been made to balance the geographical availability against considerations of absolute concentrations.

So I think the answer to your question is that we think the stockpiles are in locations—at least these locations have been chosen—with regard to where they might be used.

Mrs. GRIFFITHS. I join with the chairman in the request that you produce a plan that does something—not just one that talks.

Mr. HOLFIELD. One of our recommendations was that we envisage that new Department of Civil Defense—as we call it—to be authorized to execute all other measures necessary to establish an integrated nationwide civil defense system and to utilize toward this end such available resources and facilities of the Federal departments and agencies as are necessary.

I must address it to both of you because you both are becoming merged into an organization, and as there is no indication as to which shall be the superior, I must address these questions to both of you.

Is there any such plan? Have you talked between yourselves about any such plan to obtain a national program, a program into which the local areas will be fitted and will become a federally approved national program? Has there been anything along this line?

Mr. HOEGH. Mr. Chairman, I can answer that question. After becoming Administrator of the Federal Civil Defense, I read your committee hearings, the testimony of these hearings. I became thoroughly acquainted with H. R. 2125.

I immediately came to the conclusion that we should have a new national civil defense plan. Since August I have devoted considerable personal time, and my staff a great deal of time, in working up and preparing a national civil defense plan that gives national courses of action and defines the role of the Federal Government, the State, the local government, and the people.

I think that is important. You must have Federal leadership and direction. You must assign the mission to the respective governments. Let me assure you that each one of the points that you had in your H. R. 2125 are covered in this national plan.

We have worked diligently with governors, mayors, city, and State directors, with all Federal agencies, to the end that we could come up with a coordinated, a simple, practical, effective national civil defense plan. We don't hold it out as being foolproof, but certainly it is one that should be in time put into effect, thoroughly tested, and continuously improved and strengthened.

It is still in a working draft form because I think for it to be really effective, Mr. Chairman, it will be necessary for the Congress to pass

into law H. R. 7576, which would, as you know, create responsibility for civil defense not in just the States and local governments but in the Federal, State, and local governments.

It would additionally provide Federal funds to match the personnel and administrative expenses of civil defense functions at the State and the local level. That is needed. And third, it will provide additional money to obtain the necessary radiological devices and instruments so that the Federal Government can deliver them to the States and the local communities.

With that, and with this reorganization plan being put into effect, I think that the national civil defense plan will do a great deal in giving the leadership, the direction, the coordination that is needed for this Nation to have effective civil defense.

Mr. HOLIFIELD. Your statement is refreshing as far as your personal attitude is concerned. We hope that it goes beyond some of the preparations which FCDA has made in the past. On page 45 of our report we have the following comment on FCDA's plan:

Although the Administrator is authorized among other things to prepare national plans and programs for the civil defense of the United States, he has never construed his statutory authority to develop a realistic national plan for civil defense. The FCDA has prepared a looseleaf booklet entitled "A National Plan for Civil Defense Against Enemy Attack," but as one witness observed, this is no national plan at all, but merely a compendium of general statements and appended texts of applicable laws, rules, and regulations, a "conglomeration of everything FCDA has put out in a book."

Then it goes on to show how you have distributed your planning responsibilities.

I am speaking now about the agency before you came into it. You did not do the job of national planning in the FCDA. You distributed and delegated planning responsibilities. This is quite different from preparing a national plan and coordinating it with the local planning. This is different, as I say, if you are actually planning and formulating a national plan.

Mr. HOEGH. I have it in working draft. It is ready for action. I would like to have you take a look at it. I would like to have your comments and your recommendations.

Mr. HOLIFIELD. We will be glad to. Then maybe you are giving us some hope now. Can this committee hope that, if this plan goes into effect, your next step will be in the field of operational planning?

Mr. HOEGH. With reference to that question, certainly what Federal civil defense is doing today and what Mr. Gray's agency is doing today would go to, of course, the President; and he in turn would then transmit it to this new director.

So all the planning that is now being undertaken, all functions that are now being done, would be there. And, of course, it would be the ultimate decision of the new director as to whether he would want to abandon it, revise it, update it—whatever he wanted to do.

Certainly that would be his responsibility, if he is a good staff officer for the President of the United States.

You mentioned this plan. If you have the time, I would like to present it. I am very proud of this thing.

Mr. HOLIFIELD. This committee will surely take the time for any cooperation. We don't look upon ourselves as antagonists of the FCDA. We never have.

Mr. HOEGH. No, sir; I know you don't.

Mr. HOLIFIELD. We have looked upon ourselves as accomplices before the fact.

Mr. HOEGH. I consider you are some of the champions of civil defense. I really do.

Mr. RIEHLMAN. Could I ask, Mr. Chairman, if Mr. Hoegh is continued in this program as an official, if he is going to use every bit of influence he has to see that the program he has envisioned for an outline would be carried out?

Mr. HOEGH. Of course you are making a guess there that I might be in the new agency. Let's put it this way. If I am in it, of course I would make strong recommendations. And if I am not in it—I would still make strong recommendations.

Mr. GRAY. Mr. Chairman?

Mr. HOLIFIELD. Mr. Gray.

Mr. GRAY. There is, I think, no dissent that I know about in the executive branch of the Government and among those agencies who are concerned in these problems about the necessity—no dissent from the fact that it is necessary to have a national civil defense plan.

This, of course, is the responsibility of the Federal Civil Defense Administrator. But I can say to you that Governor Hoegh has worked very hard and I think has come up in a remarkably short time—he has only been in this job since about August—with a plan which as far as I know is generally subscribed to by the agencies. And again, without making any assumptions as to who the people are who are going to be in the principal spots in the new organization if it becomes law, I think it is safe to say that all those people who are now working on it, principally in Governor Hoegh's agency and to the extent we have had anything to do with it, everybody is for it; and I see no reason for the committee to be apprehensive that this plan will not go forward.

It may have some adjustments, but the basic notion of a national civil defense plan, I believe, will certainly be a reality.

Mr. ROBACK. Mr. Gray, Governor Hoegh was apprehensive to the investigators of the McKinsey Co. that his plan would be disrupted by any reorganization changes at that time. Subsequently, Governor Hoegh has been persuaded presumably to change his mind.

Perhaps he might want to enlighten us on his feelings as to the relation of any reorganization move now to his national defense plan.

Mr. HOEGH. I find no obstacles at all. As a matter of fact, after working out this plan, I have come to the conclusion that one office, one agency, responsible for all nonmilitary defense policies and planning and functions is going to be tremendously helpful.

Mr. HOLIFIELD. Do you think it will be in a position of more prestige and importance, this new agency, than the old agency?

Mr. HOEGH. Much more. I have been working as Administrator of an independent agency. It is my responsibility to coordinate civil defense functions within the Federal Government. I think it would be tremendously helpful for this new official to have this increased stature, because it will be necessary for him to see that certain delegations are not just delegated, but that they are executed, and with him serving as a staff officer directly under the President of the United States, I feel that he can more effectively accomplish—

Mr. HOLIFIELD. You feel that this will be a concentrating of responsibility?

Mr. HOEGH. Yes.

Mr. HOLIFIELD. And that it will give additional prestige and put you, you might say, closer to the ear of the President and closer to obtaining Presidential support of such plans as are approved by the President.

Mr. HOEGH. Yes, sir. In addition it will give you unified guidance, too, of not only the Federal agencies but unified guidance to the States and the local communities.

Mr. HOLIFIELD. You would speak with one mouth to the States?

Mr. HOEGH. Right. Then if there is something wrong he can get to the source and get it eliminated, or attempt to eliminate it.

Mr. HOLIFIELD. Leaving this field for just a moment, you no doubt have studied the McKinsey report?

Mr. HOEGH. Yes, sir.

Mr. HOLIFIELD. Are you in basic agreement with the proposed organizational structure as set forth there?

Mr. HOEGH. I have looked at both. I haven't come to a definite conclusion, but the definite conclusion would have to be based upon what I would think would most effectively accomplish this mission that has been assigned to the Office of Defense Mobilization and to the Federal Civil Defense Administration. I want to remove as much as possible the redtape and unnecessary mechanism in the way of execution and in the way of making a totally effective civil defense and mobilization planning for this Nation.

Mr. HOLIFIELD. Do you—or either of you—believe that the total number of personnel engaged in these two agencies will be enlarged or diminished?

Or can you say?

Mr. HOEGH. That is a difficult question. In this plan I am trying to look 10 years ahead instead of this 6 weeks or 6 months business. You have to look ahead.

If this Nation is to have a real, effective, nonmilitary defense, we are going to have to have a gradual improvement and strengthening of that effort and for that reason in the years ahead it may be necessary to have more people.

But in the long run, sir, it would eliminate duplication and therefore you would have less people doing the job than if you would keep two separate, distinct agencies.

Mr. HOLIFIELD. Looking at it at the present time, will there be an elimination of any of the executive personnel, or will they just more or less be assimilated, and for the time being you will go forward with the same personnel as exists in FCDA and ODM—thinking in terms of numbers now.

Mr. HOEGH. I can speak only for Federal Civil Defense now, sir. We have approximately 1,300 in our agency. There are about 57 of us here in Washington, 750 roughly out in Battle Creek, Mich., and the balance are in our regional offices throughout the Nation.

We proposed in our budget request for fiscal year 1959 an increase in our personnel up to over 1,500 because we wanted to gradually strengthen our capabilities and gradually strengthen the overall civil defense planning of this Nation. The House has given us part of it.

They did not give us all that we feel we should have in order to make this gradual improvement and gradual strengthening of civil defense.

Mr. HOLIFIELD. How many people do you have in ODM, Mr. Gray?

Mr. GRAY. We are authorized at the present time, Mr. Chairman, 238 full-time positions. They are not all filled. In our budget request for the next fiscal year, we are asking for authorization for the same number of people.

Mr. HOLIFIELD. Is it contemplated that your regional people and the regional people of both FCDA and ODM will be retained?

Mr. GRAY. Strictly speaking, ODM really has no regional people now, Mr. Chairman. The regional mobilization committees which are served by an executive officer and a secretary—these people—the executive officers and secretaries—are on loan from other agencies.

We had contemplated in our earlier planning to establish regional offices with full-time executive officers and secretaries who would be in the ODM organization. However, now that the President's plan has come before Congress and would provide for a unified regional structure, we have told the Senate Appropriations Committee that since the House cut out some of these funds, we do not wish them to restore the funds which would have supported the regional structure, because clearly one of the great advances in all of this area that we have been discussing would be to have a single voice of the Federal Government at the regional level, which would be accomplished in this plan.

We therefore are withdrawing any request for funds for that purpose, inasmuch as the Federal Civil Defense Administration already has regional offices, I think well staffed, and has funds to continue them as far as I know.

Mr. HOEGH. That is right.

Mr. HOLIFIELD. In the contemplation of a plan, there is a set of officers authorized. How does that compare with the present structural setup in FCDA?

Mr. HOEGH. In FCDA, sir, we have the Administrator and the Deputy Administrator. Then at Battle Creek, Mich., I have what I call a sort of chief of staff to look after all of the operations and planning in that office.

Mr. HOLIFIELD. Then do you not have regional directors?

Mr. HOEGH. Yes, sir.

Mr. HOLIFIELD. How many regional directors?

Mr. HOEGH. We have now, sir, 7 regions and 7 regional directors. We have seven deputies.

Mr. HOLIFIELD. The plan provides for not to exceed 10?

Mr. HOEGH. Yes, sir.

Mr. HOLIFIELD. So this is quite close to the existing structure then as far as titled positions are concerned in the plan, the setting up of titled positions?

Mr. HOEGH. Yes, sir, except when you get down to the organization, you understand we have assistant administrators for various functions and planning activities.

Mr. HOLIFIELD. Then it would be fair for me to say that you do not contemplate the elimination of any executive personnel at this time by virtue of the plan?

Mr. HOEGH. I would not want to give that as a definite "Yes." I would say that it appears so as of this time.

Mr. HOLIFIELD. That is of FCDA structure?

Mr. HOEGH. That's right.

Mr. HOLIFIELD. In the ODM structure, will you answer the same question, Mr. Gray?

Mr. GRAY. I am not sure I know what your definition of "executive personnel" is, Mr. Chairman.

Mr. HOLIFIELD. I am not sure either. I was not thinking necessarily of the rank and file workers, but men in professional positions, I would say grade 12 and above.

Mr. GRAY. If you make it that broad, I think an honest answer would say that I am unable to say that there won't be some people—when you say eliminated, I don't mean liquidated. They may be transferred to other functions somewhere in the Federal Government, or related functions.

But I think that it is obvious that when two agencies are merged, that to the extent the resulting organization has duplicating functions, it is not in the interest of the Government to continue to perpetuate this duplication.

Mr. HOLIFIELD. The Chair is not suggesting that the worth of this plan would depend upon eliminating 10 people from Government positions or 15. I didn't mean to suggest that. Certainly my judgment of the plan would not necessarily depend upon it.

I am just asking from the standpoint of the record as to whether any reduction would take place. As a matter of fact, I think if the job is done that needs to be done, you would probably have to increase your personnel in both agencies.

Mr. GRAY. Mr. Chairman, as you know there has been a lot of public discussion and discussion upon the Hill, particularly on the Senate side, about the railroads. You occasionally hear talk about railroad mergers. When two railroads merge, there are two presidents, I don't know how many executive vice presidents, et cetera.

I suppose you don't end up necessarily with two presidents, you may end up with a president and a chairman of the executive committee. Just to take a single illustration—and I am sure neither Governor Hoegh nor I know who is going to be head of the new agency—it cannot have two directors.

Mr. HOLIFIELD. You both are very capable men. If it comes to the worst, you can pitch a coin, you know.

Mr. GRAY. That would suit me well.

Mr. HOLIFIELD. In the McKinsey study on page 5-13 of the second volume we have this language:

To direct and coordinate effectively the efforts of other Federal departments and agencies, it is necessary that the proposed Office of Civilian Mobilization have its offices in the District of Columbia or its environs and be symbolically identified as the Executive Office of the President. This will mean moving certain elements of the FCDA national headquarters in Battle Creek back to Washington, but not all of them. In our view the Battle Creek facilities make an ideal location for a national nonmilitary defense training center. We would propose leaving almost all public information and education and training activities at Battle Creek. In addition, it may be feasible to continue the nonmilitary defense research and development activity at Battle Creek.

Do you agree in principle with that part of the study, and I ask this on behalf of Congressman Johansen and Mrs. Griffiths, both of Michigan.

Do you care to comment on that part of it?

Mr. HOEGH. Mr. Chairman, our operations as of now, and I think in the past, have not in any way been hampered by having our headquarters at Battle Creek, Mich. As I mentioned, we have 57 people here and we have over 750 in Battle Creek, Mich.

We, of course, advocate dispersion. I think when you advocate something you ought to practice it. Second, we have good communications in Battle Creek, Mich. They are good. We spend a lot of money in perfecting them.

Third, it is well located for the Nation. We find from that standpoint that it has been helpful to the States and to the local governments. It does reduce some of the expenses that they must incur in order to come to our schools.

Of course, Congress has had foresight. It looks like they are going to provide additional funds so that we can have a training center on the west coast and also the east coast. That will further help the States and the local governments and make our schools more accessible to them.

So generally speaking, I say that maybe some of our key personnel will come down here to be closer to these other agencies of government.

As to how many, I haven't determined yet. But I want to let the committee know, as I have others, that the operation now is effective.

Mr. GRAY. Mr. Chairman, I don't know whether you addressed that question to both of us.

Mr. HOLIFIELD. I wasn't aware that you had any people up there.

Mr. GRAY. I can only speak to one point of it. No, we are not in any way concerned with Battle Creek. Certainly Governor Hoegh's judgment of the effectiveness of the operation would be absolutely controlling as far as I am concerned.

I do think, however, as to the first part of that sentence, that it is important for the locus of the Director to be in Washington and identified with the Executive Office of the President.

I am speaking only to the first half of that statement.

Mr. HOLIFIELD. Mr. Riehlman.

Mr. RIEHLMAN. I have no questions.

Mr. HOLIFIELD. Mr. Lipscomb.

Mr. LIPSCOMB. No.

Mr. HOLIFIELD. Mr. Minshall.

Mr. MINSHALL. I have one question, Mr. Chairman. I noticed in the Governor's statement on page 7—

Mr. HOLIFIELD. Off the record.

(Discussion off the record.)

Mr. HOLIFIELD. All right, go ahead, Governor. I think you had better read this because none of us has had a chance to see it.

Mr. HOEGH. Former Administrator Val Peterson has previously discussed with you proposals relating to the organization of civil defense and defense mobilization. As mentioned by Mr. Finan in his opening remarks, this committee, and especially its chairman, has conducted most important studies which have materially assisted in the development of this reorganization plan which will facilitate the improvement of the Nation's nonmilitary defense.

In the preparation of the plan a great deal of consideration has been given to the testimony developed during the committee hearings of the last 3 years.

These committee activities, which culminated in the issuance of the committee interim report in 1956, and the introduction last year of Chairman Holifield's bill, H. R. 2125, and companion measures, are important parts of the history of the President's proposal.

Both proposals are firmly founded upon the principle that modern weapons and the means for their rapid delivery require:

1. That the total nonmilitary defense activities of the Federal Government be given a priority commensurate to that established for our military preparedness measures.

2. That each proposal recognizes the inseparability of civil defense and the related nonmilitary defense activities presently being conducted by the Office of Defense Mobilization.

3. Both proposals recognize the essentiality of integrating many nonmilitary defense activities into the normal day-to-day functions of various departments and agencies of the Federal Government.

4. H. R. 2125 and the reorganization plan are both predicated upon the principle that the nonmilitary defense responsibilities of the Federal Government must be under the general supervision of a single organizational unit and that such unit must be given a position of stature and authority. Central guidance and supervision are essential to insure that the departments and agencies are adequately prepared to carry out their assigned emergency functions.

5. The basic concept of the reorganization plan goes even further than the previous proposals. The plan will vest the total nonmilitary defense responsibility in the President and will establish, in the Executive Office of the President, the Office of Defense and Civilian Mobilization to assist him in the discharge of these responsibilities.

Consistent with this basic concept, the reorganization plan transfers the functions vested in me as the Federal Civil Defense Administrator, under the Federal Civil Defense Act of 1950, to the President.

This committee is familiar with the provisions of the Civil Defense Act, and it is not my intention to burden you with a detailed description of those functions. In general terms, the act authorizes me to prepare national plans and conduct programs designed to protect life and property in the United States from enemy attack.

More specifically, title II of that act provides authority for particular activities to be undertaken. This involves establishment of adequate civil defense communications, the development and maintenance of a national attack warning system, the conduct of civil defense studies and research, the training and instruction of civil defense personnel, the acquisition and maintenance of reserve stocks of equipment and materials for use during an emergency, the furnishing of financial assistance to the States and their political subdivisions for civil defense purposes, and the education of the population relative to civil defense measures.

Very briefly, these are examples of the preattack activities engaged in by the Federal Civil Defense Administration to develop the capability of the Nation to absorb the effects of modern war and survive if it should come.

As this committee is aware, the act, in title III, also contains many extraordinary emergency powers designed to permit the Administrator to carry out his responsibilities under attack and postattack conditions. These extensive powers, which by the terms of the statute

are exercised only during a civil defense emergency, and then subject to the direction and control of the President, would be transferred by the reorganization plan, directly to the President.

Since my appointment as Federal Civil Defense Administrator, I have become aware of the interrelationship of responsibilities discharged, on behalf of the President, by the Office of Defense Mobilization and many of the programs conducted by the Federal Civil Defense Administration. I have discussed this subject with Mr. Gray and our staffs have engaged in a continuing effort to delineate the appropriate areas of activity of the respective agencies.

To date, in my opinion these efforts have met with some degree of success; but as a result of extensive review of the problems, I have reached the conclusion that single direction of the total nonmilitary defense activities of the Federal Government is essential to the adequate development of the Nation's capability to protect life and property from attack. I believe this committee has gone on record as reaching a similar conclusion.

In addition to the civil defense functions, there is also vested in me, by Executive order, the responsibility to assist the President in administering Federal assistance to the States and cities to supplement their efforts in combating the effects of major disasters. This activity is known as the natural disaster program.

The similarity between many civil defense emergency activities and Federal action to alleviate suffering and hardship brought about by floods and tornadoes is apparent. Further, the use of State and local civil defense organizations in natural disaster work has substantially contributed to their effectiveness by providing an opportunity for the realistic testing of emergency plans.

Inasmuch as this responsibility is already vested in the President by statute, no transfer of this function would be made by the reorganization plan. It is assumed that the Office of Defense and Civilian Mobilization would, by a subsequent Executive order, be charged with the responsibility of assisting the President in the administration of this program.

As a former governor, I am aware of the practical problems facing civil defense officials at the State and local levels. Since becoming Administrator, I have been even more convinced of the importance of the role that the States and the cities must perform if our Nation is to survive a nuclear attack.

I say without hesitation that the success or failure of the Nation's nonmilitary defense effort—and I mean defense mobilization, including economic stabilization, resources management and other related activities as well as civil defense—will be determined by the way that our State and local governments operate under emergency conditions.

Further, the way that they react will be determined by the extent to which they have, during the preattack period, developed their capability to operate under such conditions.

Therefore, our total nonmilitary defense effort, including our Federal planning, must be predicated upon the development of the capability of governments, at all levels, to effectively continue to carry out their essential functions under emergency conditions.

This is why I have placed such a high priority upon the program that we call continuity of Government, as I explained earlier. This

program is designed to assist State and local governments to increase their capability to operate effectively under attack and post-attack conditions.

In order that the States and their political subdivisions can effectively plan and organize their efforts to develop this capability to continue operating, it is essential that they know what is expected of them. It is equally essential that they be advised what they may expect, in the way of assistance, from the Federal Government.

There is, and always has been, some duplication and overlap in the activities of the Federal Civil Defense Administration and the Office of Defense Mobilization. Any mayor, industrialist, or governor will agree with that statement. Perhaps in these early days of nonmilitary defense planning such overlap has not always been disadvantageous.

I am certain that much valuable experience and knowledge was gained by both the Federal Civil Defense Administration and the Office of Defense Mobilization in connection with such activities, but the disadvantages of this duplication now far outweigh any benefits.

However, one of my first tasks upon becoming Administrator was to attempt to clarify the respective civil defense roles of the Federal, State and local governments. I determined that the best manner in which to accomplish this was the development of a new national civil defense plan.

To this end, and as a matter of urgent priority, my agency is completing a plan which establishes national courses of action and sets forth step by step how the mission is to be accomplished, and by whom.

It is, of course, essential that such a plan be completely coordinated within the executive branch of the Federal Government. It is equally essential that the States and cities review it, comment on it, and make such suggestions as are necessary to insure that it is a simple, practical and workable plan.

This task is nearing completion. The plan has been accepted and approved by various representatives of State and local governments, as well as the national associations of State and local civil defense officials. During recent weeks I have personally supervised the coordination of the plan within the Federal Government. I am happy to report that there is general agreement on its major aspects.

The preparation and coordination of the new national civil defense plan confirmed my earlier conclusion that all of the nonmilitary defense activities of the Federal Government should be placed under single direction.

I am convinced that the consolidation of these two agencies, and the elimination of artificial delineations of responsibilities, will result in a substantial increase in the effectiveness of the total nonmilitary defense activities of the Federal Government.

It will certainly eliminate much of the confusion that exists in the minds of State and local officials as to which Federal agency is in charge of particular areas of activity in the event of an emergency. These results alone would be adequate justification for the acceptance of the proposal to consolidate the two agencies.

I do not want to conclude my remarks without mentioning one other thing. There are, in addition to organization, other problems facing

the Nation's nonmilitary defense program. I do not want to be interpreted as representing that the acceptance of this organizational proposal would, by itself, overnight result in adequate nonmilitary defense preparedness.

At the same time, I want to make it emphatically clear that I strongly believe that the organizational problem must be solved before any really effective nonmilitary defense planning and readiness can be achieved. It is the essential next step. However, it is certainly not the only step.

In this connection, it is also essential that the Congress approve another measure which, from the State and local civil defense standpoint, is of equal importance. I refer to the enactment of Mr. Durham's bill, H. R. 7576, which is currently pending before the Senate.

This bill was unanimously passed by the House last summer. It establishes civil defense as a joint responsibility of Federal, State, and local governments, with the Federal Government providing overall direction and coordination, and sharing the cost of civil defense functions at State and local levels.

I cannot overemphasize the importance of the passage of this legislation. Civil defense officials, mayors, and governors from every part of the Nation advise me that the enactment of this bill is essential to their development of an adequate civil defense program.

I want to thank the members of this committee for their strong support of this measure when it was being considered by the House, and ask their continuing support to secure its early passage.

In summary, I believe the President's reorganization plan will accomplish the following:

1. Strengthen the Nation's nonmilitary defense organization.
2. Increase the stature of civil defense and mobilization.
3. Provide the best overall coordination and supervision of the nonmilitary defense activities within the Federal Government.
4. Provide unified guidance and assistance to State and local governments.
5. Establish a solid foundation upon which accomplishment of the assigned mission can be accelerated.
6. More efficient and economical administration.

The close relationship between military preparedness and nonmilitary defense readiness activities, and the vital importance of both, demand—because these functions transcend the responsibilities of any single department or agency—that the nonmilitary defense functions be vested in no one short of the President.

Let me assure you that the Federal Civil Defense Administration wholeheartedly supports Reorganization Plan No. 1 of 1958 and strongly urges that the Congress permit the plan to take effect.

Mr. HOLIFIELD. Thank you, Governor, for your statement. Are there any questions? Mr. Riehlman.

Mr. RIEHLMAN. Mr. Chairman, I think Mr. Hoegh has volunteered to outline in detail his program that he has studied and prepared for making this a more effective organization. He said he would be very happy to present it to us. Is this the proper time?

Mr. HOEGH. I will do it briefly.

Mr. HOLIFIELD. Is this the plan?

Mr. HOEGH. Yes, sir.

Mr. HOLIFIELD. We will be glad to have it.

Mr. HOEGH. First, you will recall, we set out the purpose, and that is to set out these national courses of action and also assign the role of the respective governments.

Mr. HOLIFIELD. When you say you assign the roles, you really get down to the bedrock operating level and say that, "As governor of X State, you will be required to assume the responsibility for certain actions?"

Mr. HOEGH. That's right, sir.

Mr. HOLIFIELD. And of course this comes about as an agreement between your representatives and the governors of the separate States.

Mr. HOEGH. For instance, in our organization we make this statement: "Civil defense is the responsibility of each citizen and all governments—Federal, State and local, with the Federal Government having the primary role of direction and coordination of the total national effort."

Then we go further. We state that the President is Commander in Chief. The Civil Defense Administrator is the principal civil defense staff officer. Governors and mayors are commanders of their respective jurisdictions, with civil defense directors as principal staff officers.

For the plan to be effective, I want to point out I still feel that H. R. 7576 is most essential.

Then we set out our mission. I think you are familiar with it. This is the mission that we see from reading your testimony, from reading the statutes. Our mission is to protect life and property from the effects of attack by preparing for and by carrying out emergency functions to prevent, minimize, and repair injury and damage. That is our mission.

I forgot one other point above. We do set forth a planning base. Everyone should have the same planning base. We set that out in this plan. It is somewhat like military intelligence, and attached to the plan as annex No. 1.

Then in functions, the plan sets forth the functions, step by step, how the mission is to be accomplished. These are listed under "Warning," "Communications and control," "Action prior to attack," "Action after attack."

With reference to "Warning," we point out the warning spots of the Federal, the State, and the local governments. For instance, as of today NORAD—North American Air Defense Command—has the responsibility of detecting an enemy attack. Our people sit with NORAD. Immediately when our people are informed, they pick up a telephone and communicate with 200 critical points simultaneously. And this coming fiscal year that will be increased to 276 points throughout the Nation, some points being in every State in the land.

In addition to that, it will go directly to 88 radio stations and 12 national radio networks.

Then we go forward and set out uniform warning signals. It is time that people have a uniform warning signal. If you live in New York and happen to be in Los Angeles, the signal should mean the same thing there as it did in New York City. We set that out.

Then we set out warning as to fallout, what is to be done, what the responsibilities are, and so forth. Then in "Communications and con-

trol." As you know, today we have a pretty good communications system. We have telephone and teletype. Again we have asked Congress this year to permit us to back that up by radio. It is most essential that we have, eventually, radio backup in order to be certain that we can always communicate.

Congress so far has granted us sufficient appropriations to enable us to backup our telephone and teletype from the national office to each regional office. Then we hope in the next 2 fiscal years to come in and ask for backup to the States. That is most important.

On control, we note that the Federal Government has its control center, and we ask that the States and local governments provide theirs. And of course, as you know, we have matching funds to help the States and local governments to that end.

Then we get into the courses of action. I think to make this brief, when you look at this plan and you hold it right next to your H. R. 2125, and see the things that you have recommended be done with reference to planning thereto, you will find that there is some similarity.

We have gone a little further; not that you weren't complete; but there were things that I felt should be planned for in addition to these things.

We do the same thing with reference to the postattack action. Then we define clearly the national policy on evacuation and shelter. We state if sufficient warning time is available, evacuate; if not, take cover. Simple—but it means something.

Then we go on and we state this: Plans for evacuation are being developed and will be carried out only if sufficient warning time is provided. It is most likely that take cover will be the course of action executed. This is, I think, the important statement: "The action to be taken is a local decision."

Mr. HOLIFIELD. You mean the action as to whether—

Mr. HOEGH. Take cover or evacuate. The local mayor, with the advice of his civil defense staff, would make the ultimate decision as to whether the time is adequate and sufficient to permit him either to execute evacuation or to tell his people to seek the best available shelter.

Mr. HOLIFIELD. Is there any indication at all of any interest in this plan toward solving the problem of radioactive fallout?

Mr. HOEGH. Yes, sir.

Mr. HOLIFIELD. In the direction of shelter?

Mr. HOEGH. Yes, sir.

Mr. HOLIFIELD. Is there any assumption on the part of the Federal Government of recommending the types of shelters or the financing of the shelter program?

Mr. HOEGH. Mr. Chairman, at this time I am prepared to announce the administration's national policy on shelters, if you would like to have me proceed.

Mr. HOLIFIELD. We will be very glad to have you do so.

Mr. HOEGH. You see, this would become an annex to this total non-military defense plan.

Mr. HOLIFIELD. What do you mean by an "annex"? I don't quite understand that.

Mr. HOEGH. Well, sir, we have now—

Mr. HOLIFIELD. Is it not an integral part?

Mr. HOEGH. Yes; it is an integral part of the plan. But it is to keep it so people can read it and understand it. The basic plan should tell you what you are doing, and these annexes should tell you specifically what your role is and what you are to do.

The administration, as you know, has conducted exhaustive studies and tests with which you are, I know, familiar, and each one of the members of this committee is familiar.

Mr. ROBACK. Not as familiar as we would like to be.

Mr. HOEGH. Anyway, it is with reference to the effects of nuclear weapons.

Mr. ROBACK. Isn't the fact that the Gaither Committee really was set up in the first instance to study this kind of recommendation?

Mr. HOEGH. Of course the Gaither Committee made some study of it.

Mr. ROBACK. It sprang out of the administration's problem of what to do in the shelter field. Isn't that the fact? We have testimony that that was it.

Mr. HOEGH. Understand this, I have been on board 9 months. But in reading the testimony of the hearings here, and in reading many other reports, I find that this matter has been under study for many, many months and a very exhaustive study has been made and many tests have been made.

These several analyses and studies have indicated that there is a great potential for the saving of life by fallout shelters. In the event of a nuclear attack on this country, fallout shelters would offer the best single nonmilitary defense measure for the protection of the greatest number of people.

Furthermore, a nation with adequate fallout protection is a nation which would be more difficult to successfully attack. This fact alone would substantially lessen the temptation of an aggressor to launch an attack.

The Administration's national civil defense policy, which now includes planning for the movement of people from target areas if time permits, will now also include the use of shelters to provide protection from radioactive fallout.

To implement this established policy, the Administration will undertake the following action:

1. The Administration will bring to every American all the facts as to the possible effects of nuclear attack and inform him of the steps which he and his State and local governments can take to minimize such effects.

The present civil defense programs for information and education will therefore be substantially expanded in order to acquaint the people with the fallout hazard and how to effectively overcome it.

The public education program will include information on the following:

- (1) Nuclear weapons effects on people, plants, and animals.
- (2) The provision of effective fallout protection, how to construct a fallout shelter, and how to improvise effective shelter.
- (3) Necessary measures for the protection of food and water.
- (4) How to carry out radiological decontamination.
- (5) What the Governments—Federal, State and local—are themselves doing about fallout protection.

The second step and the second action:

2. The administration will initiate a survey of existing structures on a sampling basis in order to assemble definite information on the capabilities of existing structures to provide fallout shelter, particularly in larger cities. Many facilities such as existing buildings, mines, subways, tunnels, cyclone cellars, and others already afford some fallout protection. Action will be taken to accurately determine the protection afforded by all of these existing facilities in order to make maximum use of them.

3. The administration will accelerate research in order to show how fallout shelters may be incorporated in existing, as well as in new buildings, whether in homes, other private buildings or Government structures. Designs of shelters will be perfected to assure the most economic and effective types.

4. The administration will construct a limited number of prototype shelters of various kinds suitable to different geographical and climatic areas. These will be tested by actual occupancy by differing numbers of people for realistic periods of time. They will also have practical peacetime uses.

Some of the prototype structures will be incorporated in underground parking garages; under-street shelters; subways; the Federal highway program—patrol and maintenance facilities; additions to existing schools and new schools, including such facilities as cafeterias, assembly space and classrooms; additions to existing hospitals and new hospitals, including such facilities as cafeterias, visitors' and convalescent rooms and reserve areas; industrial plants; commercial buildings; family residences and apartments, including such facilities as bathrooms, garages, basements, and recreation rooms.

5. The administration will provide leadership and example by incorporating fallout shelters in appropriate new Federal buildings hereafter designed for civilian use. Federal example is an indispensable element to stimulate State and local government and private investment for fallout shelters. Community use of the shelters in these new buildings of course is contemplated.

There will be no massive federally financed shelter construction program.

With reference to blast shelters, there are still difficult questions, having to do with the amount of time that would be available to enter the shelters, the uncertainty of missile accuracy, and the effectiveness of our active defense. There is no assurance that even the deepest shelter would give protection to a sufficient number of people to justify the cost. In addition, there may not be sufficient warning time, in view of the development of missile capabilities, to permit the effective use of blast shelters.

Our chief deterrent to war will continue to be our active military capability. Our active military defense may eventually have the capability of effectively preventing an enemy from striking intended targets. Highest priority is to be given to the development of this capability.

Common prudence requires that the Federal Government take steps to assist each American to prepare himself, as he would through insurance against any disaster, to meet a possible—although unwanted—eventuality. The national shelter policy is founded upon this principle.

This approach will provide the stimulation necessary for the American people to make preparations for fallout protection. The Federal Government will also work with State and local governments and with private industries to expedite and facilitate the provisions of fallout shelter.

The administration believes that when the American people fully understand the problem that confronts them, they will rise to meet the challenge as they have invariably done in the past. This is particularly true now that the national policy has been declared, backed up with Federal example, Federal leadership, and Federal guidance. Protection of our people is not new in the United States. When a free America was being built by our forebears, every log cabin and every dwelling had a dual purpose—namely, a home and a fortress. Today the citizen should be called upon to make the same contribution as our forebears—not for building a free America, but for sustaining a free America.

The President has directed me to put this policy into effect.

Mr. HOLIFIELD. Are there any questions?

Mr. LIPSCOMB. I would like to ask one. Governor, in developing this plan, was there any thought given to allowing homeowners, if they decided to build a shelter, to take a tax deduction or get some kind of a tax credit to encourage them to build?

Mr. HOEGH. That has been considered, sir. I would say that every approach has been considered.

Mr. LIPSCOMB. But that is not included?

Mr. HOEGH. No, sir; it is not.

Mr. RIEHLMAN. There is nothing to prohibit the Federal Government from proceeding along some line to initiate legislation that would give tax relief to the individuals should they enter into a program of building shelters in their home or industry either, is there?

Mr. HOEGH. Mr. Riehlman, I do feel that this program could, if put into effect, ultimately accomplish the mission that we want to accomplish; and that is, provide the people of this Nation with protection from radioactive fallout.

Mr. MINSHALL. What would be the cost of a program like this? Have you any figures on that?

Mr. HOEGH. Of course we are talking now about the cost to the people and to the State and the local governments and to the—

Mr. MINSHALL. The overall cost, yes. The taxpayers have to pay it eventually, whether they pay it at the Federal level or the State level; the overall cost.

Mr. HOEGH. Of course this, as you know, is predicated upon the principle of self-help—individual responsibility. I think by using existing facilities and by improvising fallout shelters in people's homes, in their basements, in their bathroom facilities, their garages, and so forth, depending upon the area, you will greatly reduce the cost to the American people over that which has been recommended by others.

Mr. MINSHALL. What is your estimate as to the cost in dollars and cents?

Mr. HOLIFIELD. To whom, Mr. Minshall?

Mr. MINSHALL. To the overall picture, to the people, to everyone. What is this going to cost? We are all participating in it.

Mr. HOEGH. That is, to everyone?

Mr. MINSHALL. To everyone. That is what was originally asked.

Mr. HOEGH. By making maximum use of existing facilities—and that, of course, the Federal Government is going to help accomplish—I would say that it would be greatly reduced over the \$20 billion that has been recommended in the past or stated in the past—greatly reduced over that.

Mr. MINSHALL. By “greatly reduced,” what do you mean? What is your best estimate in dollars and cents?

Mr. HOEGH. I would think at least by half or more.

Mr. MINSHALL. I realize it is an estimate. What is your best estimate, then? By half or more, would it come down to \$1 billion?

Mr. HOEGH. No, I don't think it would come down to that, sir. My best estimate at this time—

Mr. MINSHALL. I realize it is just a guess now, but what is your best guess now?

Mr. HOEGH. My best guess would be that it would cost less than half.

Mr. MINSHALL. Give us a figure, please.

Mr. HOEGH. \$20 billion has, I think, been mentioned in the past by some; and I understood that someone testified here yesterday that it might be \$12 billion. By using existing facilities and by improvising, I think it would be cut below \$10 billion.

Mr. MINSHALL. How many billions of dollars?

Mr. HOEGH. That would be most difficult for me. I would have to confer with my engineers and other—

Mr. MINSHALL. Do you know or don't you know, Governor?

Mr. HOEGH. I would say it would be \$10 billion or less that it would cost all of the people.

Mr. MINSHALL. \$10 billion or less is a lot of money.

Mr. HOEGH. Of course it is, sir. I don't want to minimize that. But let me point this out—

Mr. MINSHALL. I am not trying to belabor this point. I would just like to get a definite figure. What is your best guess? Ten billion dollars or less is not a good answer.

Mr. HOEGH. All right, let me then make this statement. I would say between \$5 and \$10 billion.

Mr. LIPSCOMB. Would you yield a minute?

Mr. MINSHALL. Yes, I will.

Mr. LIPSCOMB. Actually, Governor, you don't know.

Mr. HOEGH. He has asked me to guess.

Mr. LIPSCOMB. This isn't the time to make an estimate, I don't believe. I think it is better to say you don't know.

Mr. HOEGH. I at least want to be honest with him and give him a guess.

Mr. LIPSCOMB. You are going to start a survey on existing facilities.

Mr. HOEGH. That's right.

Mr. LIPSCOMB. So you don't know.

Mr. RIEHLMAN. Mr. Chairman, isn't the Governor's statement predicated on the information that he is talking about, other figures that

have been given across the Nation to some degree? I think my colleague, Mr. Minshall, I am sure, understands that anything you are trying to give us here this morning is purely a guess, because you just outlined the program to us as to what the Government intends to initiate and suggest that the individuals help themselves instead of the Federal Government going into it.

For you to pick out of thin air a dollar mark, a price mark on it, I think is, as my colleague from California has said, putting you in an embarrassing position. I don't think you ought to guess on it.

Mr. MINSHALL. Mr. Riehlman, it is not my intention to put the witness in an embarrassing position.

Mr. RIEHLMAN. I agree with you. That is my own personal feeling on it. I don't think you intend to put him in an embarrassing position. But I think it is just the same, because I think it is an unfair question because I don't think the Governor is in a position to answer it intelligently and factually.

I don't think he should try to.

Mr. HOEGH. Of course I qualified it. He wanted a guess, and I am a great guesser. I will make one other guess. I would venture the Iowa football team will defeat the University of Michigan by 14 points.

Mr. MINSHALL. In making this program, Governor, you have certainly had preliminary surveys made before you came up with any such program as you have offered here this morning, and there has certainly been some figures bandied around, have there not, as to the cost of this whole program?

You just didn't go ahead and blindly go into a program without making some kind of an estimate as to what it would cost. That is all I wanted to know.

Mr. HOEGH. Of course our primary concern is to come up with a program that we feel will effectively protect the American people. When you start talking about a dollar and compare it with a life, then I think that would be unwise—

Mr. MINSHALL. That is not my question at all. I wanted to know how much you thought this might cost. If you don't know, all you have to say is "I don't know."

Mr. HOEGH. I told you I don't know, and I gave you a guess. How good it is, I don't know, sir. I don't want to belabor the point. The thing I would like to mention is this, that the American people each year invest \$10 billion in casualty insurance, and they think it is a sound investment. They do that each year. They do it in order that they can recover a monetary reward for any loss that they may sustain.

I think in this way the people providing for fallout protection make another sound investment. First, it would give them ultimate protection from radioactive fallout if we should have a nuclear attack; and secondly, it would do this: It would be a real contribution by the American people to the overall national security of the Nation, because then the citizen knows that he has created for the Nation an additional deterrent to war.

Mr. MINSHALL. In your guesstimates—if we may call them such—what percentage of Federal funds would be used in this program?

Mr. HOEGH. That is what we are in the process of staffing at this time, and no doubt later we will have those figures and will submit them to the Congress.

Mr. HOLIFIELD. As a matter of fact, there are no Federal funds contemplated for construction of general purpose shelters.

Mr. HOEGH. Only the prototypes, sir.

Mr. HOLIFIELD. Only the prototypes, such as we have over here, but in a large size.

Mr. HOEGH. Mr. Chairman, in addition to incorporating fallout protection in new Federal buildings for civilian use.

Mr. HOLIFIELD. May I comment upon some parts of your statement. First I want to compliment the administration on acknowledging that there is a factor in civil defense known as radioactive fallout. This is the first official recognition that there is such a factor as radioactive fallout in this modern world of ours.

The next thing—I will take this up point by point. Point No. 1 on the front page, you will bring the facts to the people of nuclear attack and inform them of the steps which they and their State and local governments can take to minimize such effects.

This you are supposed to have been doing for many years now. Now your public education program will include information on nuclear weapons effects on people, plants, and animals. This also is supposed to have been in effect for a long time, and I trust that you will accelerate it and hope you will.

Two, the provision of effective fallout protection, how to construct a fallout shelter, and how to improvise effective shelter. Of course in any kind of shelter program, the utilization of existing structures and the improvement of existing structures has long been recognized as one of the assets that we have in a possible shelter program, and also the improvising in basements—this is nothing new. This has been in the Federal civil defense program for a long time.

We have had pictures of slant construction in basements and sacks of dirt and different other methods by which these improvised shelters could be made.

No. 3, the necessary measures for the protection of food and water. I assume this will be to place the food and water where radioactive fallout would not contaminate it. This presupposes having a place to put it.

No. 4, how to carry out radiological decontamination. This will be the least thing to be worried about in case of a nuclear attack because any kind of decontamination that we know about is so ineffective for all intents and purposes. The passage of time is the only decontamination that is of any importance at all. You may wash it off of your person, but you can't remove radioactivity permanently by any decontamination method that is known.

No. 5, what governments—Federal, State and local—are themselves doing about fallout protection. I assume that is informing the people what the governments are doing in governmental buildings.

No. 2, the administration will initiate a survey of existing structures on a sampling basis. This has already been done in many places in the country, as you know. There have even been studies and surveys, and I suppose this will anticipate a large boondoggling program of granting contracts all over the Nation to survey existing structures on

the basis of preparing evacuation plans in the past. I suppose it would be that type of thing.

Or maybe you will ask the citizens to do this voluntarily, too.

In order to assemble definite information on the capabilities of existing structures, particularly in our larger cities, this will take real experts to do this job because no amateur can evaluate radioactive protection. This will really require experts. The only way I know to get experts is to hire them.

Your following statement that existing buildings, subways, mines, tunnels, and so forth already afford some fallout protection—no one can quarrel with that. That is true.

No. 3, you are going to accelerate research to show how shelters may be incorporated in existing as well as new buildings—whether homes, private buildings, or governmental structures. All this is good. There is nothing wrong about that.

But it doesn't face up to the problem. Then your building of prototypes: This will serve as demonstrations and probably cost analysis of shelters, and this is all good from the standpoint of finding out the type of shelter required and the cost of shelter, and of course your dual purpose using underground parking garages and understreet shelters, subways and all that sort of thing—that has all been contemplated in the past if a shelter program was added.

Certainly schools should be encouraged to have some protection for the children. Every school in America today, because of the large expanse of exterior glass openings, is a deathtrap for every school-child in America in the case of nuclear war because of flying glass.

I don't know how far you expect to go in giving advice along this line. And you go on down through the rest of these buildings. There is no use in going over it. But on page 4, your reference to difficult questions, there will always be difficult questions and there will always be a lack of knowledge of where the missile is going to fall.

These things should be taken into consideration as being a permanent factor which will always remain and not something that can be found out. We know in addition that there won't be sufficient warning time to give all of the people a chance to survive. Certainly if they do not have a place to go, there will be no time for them to survive.

We all recognize that our active military capability is the chief deterrent to war, but we—who have studied it—also know that they do not have the capability nor will they have the capability of effectively preventing an enemy from striking an intended target. In modern warfare, the advantage of offense has so far exceeded that of defense that we can contemplate that if a nuclear war occurs, there will be a tremendous infiltration of any country that is attacked.

To get down to the bottom, this is particularly true now that the national policy has been declared, backed up with Federal example, Federal leadership and Federal guidance—you only left out one thing, and that is Federal funding of the shelters to provide for the protection to the people of America.

I want to read to you at this time a paragraph from our 1956 report on page 23:

Besides evacuation, FCDA has found another way to avoid an expensive shelter program. Let each individual build his own, providing he can afford it, and has a basement or a backyard. Administrator Peterson and other FCDA officials have attributed this individual shelter approach to the refusal of Congress to appropriate the large sums necessary for group shelter construction. It turns out, however, that for the whole term of his office, Administrator Peterson has not proposed a group shelter construction program.

Recognizing the difficulties under which you work and the fact that you have to have any plan that you present accepted at higher levels, this committee, because of its knowledge in this field, must go on record—at least the Chair goes on record at this time—as saying this, too, is a very feeble step toward the Federal Government accepting the responsibility of protecting the lives of the American people in the nuclear age.

It is a futile and inadequate step and will not give protection to the people of America, such as I wish that it would.

Mr. MINSHALL. Mr. Chairman, will you yield at that point?

Mr. HOLIFIELD. Certainly.

Mr. MINSHALL. Are you in favor then of putting in a \$20 billion air-raid shelter construction program right now?

Mr. HOLIFIELD. The recommendations of this committee are very clear. I stand behind them today as I did 2 years ago. If you will read section 4 of it, the master plan for civil defense should be pointed toward the establishment of an integrated, nationwide civil-defense system based on the key civil defense measure of shelter protection against the blast, heat, and radiation effects of nuclear explosion, and there can be no Federal civil defense program in America of any consequence or of any successful result unless the key measure of shelter protection is given to the people of America.

Twenty billion dollars doesn't scare me at all. I voted \$38 billion for highways this year. I will vote some \$40 billion for military defense, and if the cost be \$20 or \$30 or \$40 billion, it can't be spent in 1 year. It will have to be spent over a period of time. But there could be a program which the Federal Government is constitutionally responsible for, by the way, and that is the protection of the people of America from enemy attack—there could be a program started which would give hope to the people of America.

This shelter program which the administration has offered here will not do the job.

Mr. RIEHLMAN. Mr. Chairman, if I might be recognized. I certainly cannot agree 100 percent in your observation that this isn't something that will give protection to our people. I think that they—the administration and Governor Hoegh—have outlined a constructive approach, one that I think the people should at least be willing to participate in, our own States and our own individual people.

I don't back away from our recommendations that the Federal Government should take a stronger position. I do say this—and I say it, I think, with some knowledge of the attitude of the Congress itself, and I think you would have to concur in my position—for us to present to the Congress today a proposition for the construction of shelters in the way of \$20 to \$40 billion is an impossible thing. I don't think the Congress is going to accept it.

I do think there is an opportunity for us here to bring this to the attention of the American people and let them start in a minor way to protect themselves. We should use the facilities we now have and start on a program. As an alternative to what we have in the way of a complete construction program of shelters throughout the Nation, I think that somewhere along the line my colleague suggested, that we have a uniform program instituted and that certain relief in the way of taxes be given to the individual who puts it in his home. Every Federal building that is constructed should include some shelter.

Every school that is constructed from now on should include a shelter, and some provision should be made for the cost for that type of construction. Then we will get something underway.

But I just don't feel that we want to say, and I can't concur with my good chairman, that this is completely a futile attempt. I think it is an honest attempt on the part of the administration. It is a presentation of at least an approach to this thing, although not as far as I would like to see it go, and I would say that as of today. But in view of what I have said about our own legislation, Mr. Chairman, I just don't feel that we are going to be able to get everything that we want.

My first hope is if we can't get our bill, then we will take the reorganization plan. It is a step in the right direction.

Mr. LIPSCOMB. Mr. Chairman, I feel a great deal as Mr. Riehlman does. We have been at a halt as to a national policy on shelters. At least this is a step. I don't think it goes far enough. I don't believe the complete picture has been looked at. I think there are many incentives you are going to have to give to homeowners if you are going to get them to cooperate. At least it is a recognition of the problem, which we have needed. At least we are doing something, although it is not enough.

If I may go one step further, the national plan that you have been working on—and we are just talking about evacuation—I think this should be reevaluated in the light of this national shelter policy. I don't think you should hold out so much hope to people to evacuate and not recognize the danger of radioactive fallout.

You can't hide from it. You can't evacuate from it because you don't have any plans to evacuate to a shelter.

Mr. HOEGH. Of course we are not holding to it. We say you should prepare plans to execute it should the time be sufficient to permit you to do it.

Mr. HOLIFIELD. It isn't only time, Governor. The time has nothing to do with it. Time to evacuate doesn't mean a thing. You get the people out in the country where the radioactive dust falls and it kills them just as well as if you had left them in the city.

Mr. HOEGH. I know that.

Mr. HOLIFIELD. Time to evacuate—this is a concept of the past unless you evacuate to prepared shelters where food and water and medical supplies and other things are offered. I have no desire to argue the details of this.

Of course what you have offered here is merely a commonsense start toward what we ought to have. But if we are spending \$40 billion a year on the basis of a possible nuclear war, the reason we

are spending that \$40 billion is to protect our people and the continuity of our institutions. The administration fails to come up and face this issue and recommend an effective shelter program. I am not saying that the Congress would follow such recommendations. I don't know.

But certainly the Congress will not take this matter under serious consideration unless it does have leadership from those who are charged with discharging the responsibility of protecting the American people. That is in your organization. It will be in the new organization.

Mr. HOEGH. That's right.

Mr. HOLIFIELD. And the new organization will place it in the Office of the President, and the President will be directly responsible to the American people when this plan goes through if there isn't an effective plan, a plan which has been approved by every responsible study group. The Gaither group, the Johns Hopkins group, the Rockefeller group, and other responsible groups that have studied this program, have said that the key feature of a manageable civil defense system is a shelter program.

You are not going to get a shelter program for the people in this way by advising them to build their own shelters, no more than you can get an army or a navy or an air force by advising each one to buy himself a jetplane. You can't do it that way.

It has got to be done not only with Federal leadership and guidance, but with Federal funding as a constitutional responsibility to protect the lives of the American people. This is the only way it is going to be done, and that type of leadership has to come from those that are responsible for the protection of the lives of the people.

When it is offered to the Congress and then the Congress turns it down, then I say the blood will be on the head of the Congress. But, until it is offered, until that leadership is given, the blood is on the hands of those responsible under the Constitution for the protection of the lives of the people in case of war.

Mr. HOEGH. Mr. Chairman, let me say this: In my opinion, this is a most realistic and practical approach. I am convinced that we will attain effective protection from radioactive fallout upon the adoption of this program. This policy is now a fixed, national policy.

Mr. HOLIFIELD. I am glad to see that step taken. It is a recognition of the facts of life. It is, at least, a recognition of the facts, as far as that goes.

Mr. HOEGH. Let me point this up. I believe people will respond. They have been waiting for a definite policy, Federal policy. It is established here.

Secondly, they want Federal leadership, guidance, and, above all, they want example. And it is provided here. I have the utmost confidence that, with the support of people like you and with others who are interested in this problem, we can have protection from radioactive fallout by this method. One hundred and fifty years ago—

Mr. MINSHALL. Mr. Chairman?

Mr. HOLIFIELD. Just a minute, until he finishes.

Mr. HOEGH. One hundred and fifty years ago, our mission and our obligation was laid down for all people, and that is to provide for the common defense. I am confident the people will respond and will

provide for this fallout protection now that we have the policy, the leadership, guidance, and example.

Mr. HOLIFIELD. Mr. Minshall.

Mr. MINSHALL. Mr. Chairman, at the outset I want to say that I have the highest regard for you as a chairman, and, if I differ with you on matters of detail, I think it is my right and prerogative.

Mr. HOLIFIELD. It certainly is.

Mr. MINSHALL. I would like to associate myself with the remarks made by Mr. Riehlman and Mr. Lipscomb, and I should also like to point out that the report that you referred to, of the 84th Congress, I should like to make it clear that at the time that report was made I was not a member of this committee.

But there is one thing that occurs to me on this federally financed massive shelter program that you advocate. I am just as much interested in the welfare of the citizens of this country as you are, Mr. Chairman, But I sometimes wonder if the boys in the Kremlin don't clap their hands and say, "Well, there they go, spending themselves to death into bankruptcy," which is what they have been hoping for and which we will do if we get into too many of these tremendous, federally financed programs.

I think the proper place for a program like this is to put sufficient money in a public-relations program and have the States and the individuals do it, and give them some kind of tax relief as an incentive. But to go along with a federally financed program that would involve initially \$20 billion is ridiculous. We had testimony here the other day what one program would cost just to put a fancy gold-plated shelter under the city of New York; that program, alone, would have cost close to \$5 billion.

I certainly cannot in my good conscience go along, at least at this time, with any such kind of thinking that the Federal Government should jump in and spend billions of dollars when the status of our economy is such as it is today. Especially when the burden on the taxpayers is already far too heavy.

Mr. HOLIFIELD. The gentleman is entitled to his opinion.

Mr. Lipscomb has a question.

Mr. LIPSCOMB. Governor, you mentioned in part of the conversation—I don't know whether it was prepared or just off the cuff—about the warning system that you had set up.

How do you envision the warning system working in the reorganization plan?

Mr. HOEGH. The existing warning system, as we have it today, does this—

Mr. LIPSCOMB. I know what it does, but what are you going to do? Who is going to run it? Who is going to operate it? Who is going to direct it?

Mr. HOEGH. I don't envision a change there. There may be. That would be the prerogative of the new Director. But I feel that the system we have today is sound. We sit right there with the military, and have simultaneous access to the warning information. We immediately and simultaneously notify 200 critical points, and then the responsibility is for the State governments to send it to the local government and the local government to the people.

Mr. LIPSCOMB. Is the warning system, in your definition, an operating function or a coordinating function, or what?

Mr. HOEGH. It is a function—no question about that. It comes close to what I would consider an operating function, because it is part of operation, and the people must know.

Mr. LIPSCOMB. Mr. Gray says the role of the Office of Defense and Civilian Mobilization, at best, will be one of direction, coordination, and stimulation. Under which one of these titles or duties does the warning system come?

Mr. HOEGH. I imagine under direction. That would be his interpretation. What was that again?

Mr. LIPSCOMB. The role of the Office of Defense and Civilian Mobilization, at best, will be one of direction, coordination, and stimulation. There is nothing said, at least in this definition of the Office, about operating.

Mr. HOEGH. Let me say again, I think the way that we do warn now is effective. The general channel is good. We disseminate it to the States in the critical-target cities. They have the responsibility, the State governors, of disseminating to the local communities, and the local government disseminates it to the people. I think that is a good channel.

Mr. LIPSCOMB. Have you had the opportunity to look at the chart of recommended organization for civilian mobilization?

Mr. HOEGH. Yes, sir.

Mr. LIPSCOMB. In that chart—I haven't had any specific information on it, because we haven't been able to get it—but under the delegation of duty to the Department of Defense, No. 1 is warning. Do you agree that this delegation of duty should be given to the Department of Defense?

Mr. HOEGH. I have said that I was very satisfied with the way that we are now doing it. This is a recommendation, Mr. Congressman, that we, of course, would evaluate. I have not come to a conclusion whether I would shift from the old position, because it has been working effectively.

Mr. HOLIFIELD. Excuse me. It is divided into two parts—your military part and then your civilian obligation of distributing the warning. So, it is a combination function now, isn't it? You get your early warning from the military.

Mr. HOEGH. Yes. Our officials sit with the North American Air Defense Command in Colorado Springs.

Mr. HOLIFIELD. That's true. But I am talking about the warning that comes in to Colorado Springs. That comes from the military.

Mr. HOEGH. Oh, yes; they still have that responsibility, and should.

Mr. HOLIFIELD. From that time on you take over the function for the continental United States?

Mr. HOEGH. Insofar as the civilians are concerned. They alert their military.

Mr. HOLIFIELD. To be responsive to Mr. Lipscomb's question, is it envisioned that all warning will be delegated to the military under this recommendation? I am not saying you are going to accept it.

Mr. HOEGH. I think that that is included in one of the recommendations, one of the plans.

Mr. HOLIFIELD. Would this carry through right down to the local community? Would the military warn the local community then and take over your function that you now perform from Colorado Springs?

Mr. HOEGH. I don't think it should. I think we ought to keep this channel—the mayors should get it, and he has the responsibility for taking the action. I think that is what would be done even under that suggested reorganization chart.

Mr. LIPSCOMB. If I am not mistaken, the Bureau of the Budget testified yesterday that this organization chart was substantially the way that they envisioned the program after the reorganization plan went into effect.

In other words, they were satisfied with this organization. It was also my understanding up to this point that these duties would be delegated throughout the agencies of Government and would leave, as Mr. Gray pointed out, just certain functions—the direction, the coordination, and all the rest. And as indicated on the organization chart, the Office of Civilian Mobilization would develop assumptions, direct, coordinate, and test readiness measures and plans, perform specialized functions of FCDA that cannot be delegated, public information, training, research, shelter policy, and central RADEF activities, and develop plans and programs for the Government organizations and emergency controls.

This is the way we see the reorganization before us. This is what we are going to vote on to support the President's reorganization.

You have pointed out six general items you hope to accomplish, including economy and efficiency. But I think Congress is entitled to have some idea of what specifically we are going to do in reorganization. That is why I was asking the question. Certainly, for example, some thought must have been given to what are you going to do with warning?

Are you going to keep it or are you going to delegate it?

Mr. HOEGH. Specifically with reference to warning, again I say that the system we have has proven effective.

Certainly the burden of proof would be placed upon anything that would be submitted as against that. That is a recommendation, sir, as appears in that chart. That is for the new Director to evaluate. He does not necessarily have to accept it.

Mr. LIPSCOMB. You are either going to delegate the duties around the director or else you are going to still have split commands in three chains, as has been pointed out in previous testimony.

Mr. HOEGH. With reference to delegations, there will be delegations. There are delegations today by the President to various departments.

I wanted to point out that by having this Office of Defense and Civilian Mobilization immediately under the President, I believe that you can do a more effective job of getting performance after you delegate it, and secondly, that you coordinate. That is most important. It is all right to delegate to experts, and we would continue to do that. But be certain that the delegations are executed and that they are coordinated with the overall nonmilitary defense.

Otherwise you have inconsistencies.

Mr. HOLIFIELD. I think it at least fair to say that as far as this study is concerned, the committee cannot accept these recommendations as being the pattern which will obtain, that the recommendations will be considered, some of them may be accepted and some of them may be rejected.

Is that correct?

Mr. HOEGH. That's correct, sir.

Mr. HOLIFIELD. So, from a standpoint of the committee having knowledge as to what is going to happen, we do not have knowledge by looking at this. We can understand only as to the general recommendations that have been made. But we have no specific knowledge as to compliance with the recommendations.

Mr. HOEGH. Mr. Chairman, that is one reason why I spent some time in trying to outline this national civil-defense plan. I wanted you to know what we are doing today and what should be done in our opinion in the future.

Therefore, the organizational chairman would have to take into consideration not only the performance of this nonmilitary job—particularly the civil-defense work—but also should take into consideration the functions and the performance by the now existing agency of Office of Defense Mobilization.

Mr. HOLIFIELD. Before we leave this, you had one question and then I am going to recognize some of the visiting Congressmen.

Mr. ROBACK. Mr. Lipscomb's question went to the distribution of functions and the Budget Bureau testified that, so far as they were concerned, this is the organization they would recommend.

The organization plan as it came up in discussion is not a plan for civil-defense organization. It is merely a shift of functions. Some of that as far as the civil-defense plan or program is concerned is indeterminate, and that rests on subsequent decisions of the President.

Is that a correct statement?

Mr. HOEGH. Of course it would be the ultimate decision of the President, but certainly he would, as he always does, look to his staff officers for recommendations.

Mr. HOLIFIELD. We realize that.

Mr. HOEGH. That would be my responsibility.

Mr. HOLIFIELD. We realize that. The point of the question was that we cannot at this time fix the procedures which will be followed by the new organization in accepting or rejecting the separate recommendations of the McKinsey report. The committee cannot rely on this as a plan of procedure.

Mr. HOEGH. I believe, sir, when you know, as you do, the functions of civil defense and the functions of ODM, and you recognize that they are now to be placed into the President, that certainly these functions that are now being performed are going to be performed by this new agency, either directly or by indirect delegation.

But even when you delegate a function, you have the ultimate responsibility of seeing that it is performed. You don't delegate it away. You then have to make certain that there is performance.

So I feel that your committee can look into what the actions are and the functions are of civil defense and ODM and that you would know generally that that is going to be done in the future.

Mr. HOLIFIELD. At this time I wish to recognize Mr. Hoffman of Michigan. He is an ex officio member of the subcommittee.

Mr. Hoffman, at this time we would be glad to extend to you the courtesy of questioning either of the witnesses, if you desire.

Mr. HOFFMAN. I am relying upon my colleagues.

Mr. HOLIFIELD. Mr. Johansen, would you like to ask a question?

Mr. JOHANSEN. Mr. Chairman, first of all, I would like to ask if it is in order—I am not sure as to the status of the McKinsey report—to include two paragraphs from it in the record relating to the physical location of the Office of Civilian Mobilization.

Mr. HOLIFIELD. I have read that part of it into the record, Mr. Johansen. If you wish to have it reproduced again, we will be glad to have it.

Mr. JOHANSEN. Once is sufficient.

Mr. Chairman, I have just one question to direct to the Governor and also to Mr. Gray if he would care to comment on it. In doing so, I have a responsibility to the district and community I represent with respect to the economic stability of the community, with respect to plans now currently underway to improve some of the housing facilities and to take other steps based on the premise that there will be a major operation continued in Battle Creek.

I am concerned also from the standpoint of the principle of dispersal, from the standpoint of efficient operations in the interests of the national security which at all times is the paramount consideration.

Would you care to comment, Governor, and Mr. Gray, as to any implications of this proposed reorganization with respect to the continued maintenance of the very substantial share of the operations of Federal civil defense, national headquarters, and/or the newly designated agency in Battle Creek?

Mr. HOEGH. I have no hesitancy, Mr. Johansen, in restating what I had previously stated to the committee, and that is that our operations in Battle Creek have been effective, with good communications there. It is accessible to the people throughout the Nation, and that it does permit us to practice what we advocate by having dispersion.

I do not see any great change in the facilities that we are now occupying in Battle Creek, Mich.

Mr. JOHANSEN. I appreciate that statement and will be glad to have Mr. Gray comment, if he cares to.

Mr. GRAY. As we went over this a little earlier, sir, while you were not in the room, I don't think I have anything to add to what Governor Hoegh has said. It is my understanding that the Bureau of the Budget has made certain observations to Members of Congress, and perhaps to you, about this.

The only comment I made earlier for the record is that as far as that portion of the McKinsey paragraph to which you referred is concerned which relates to the locus of the office of the Director of Defense and Civil Mobilization, I agree that that office must be in Washington.

But as far as the activities and functions which are carried on now by the Civilian Defense Administration are concerned, I don't have anything to add to that.

Mr. JOHANSEN. Neither of you would anticipate there would be any major or appreciable transfer of personnel in proportion to the present personnel?

Mr. HOEGH. That is correct.

Mr. JOHANSEN. Mr. Chairman, I had had the impression these questions had not been asked. I apologize for burdening the record.

Thank you.

Mr. HOLIFIELD. Mrs. Griffiths?

Mrs. GRIFFITHS. No, I have no questions.

Mr. HOLIFIELD. Any further questions by any members of the committee?
Staff?

Thank you very much for your testimony, Governor Hoegh. I apologize for the lateness of the hour, but we thought this might prevent us from having to have another session.

Thanks to you, Mr. Gray, for your attendance.

Mr. HOFFMAN. Mr. Chairman, I did forget one thing. I understood the witness to say this delegation of authority was going to be immediately under the President.

Who do you mean?

Mr. HOEGH. No, sir.

Mr. HOFFMAN. You said immediately under the President?

Mr. HOEGH. Yes.

Mr. HOFFMAN. Who is actually going to do it?

Mr. HOEGH. The President does it, sir.

Mr. HOFFMAN. He isn't going to do it all. We know that.

Mr. HOEGH. Of course as the staff officer we prepare them and coordinate them. It is actually signed by the President, sir.

Mr. HOFFMAN. I know that. But who comes up to him with the statement about what we are going to do? Is it Sherman Adams or is it this fellow, that fellow, or who?

Mr. HOEGH. The Director.

Mr. HOFFMAN. Who is he?

Mr. HOEGH. In this instance on civil-defense matters, sir, it is the Administrator, and that is myself. We, or I, with my staff perfect what we feel would be logical delegation.

After we have it coordinated, sir, we then take it to the President and he then either approves or rejects.

Mr. HOFFMAN. Then you are going to give the advice to the President of what should be done in this case?

Mr. HOEGH. Yes, sir.

Mr. HOLIFIELD. Is that all, Mr. Hoffman.

Mr. HOFFMAN. Yes.

Mr. HOLIFIELD. Thank you very much.

The committee will be adjourned.

(Whereupon, at 1:15 p. m. the subcommittee adjourned.)

APPENDIX

EXHIBIT A—MCKINSEY & Co. REPORT ON NONMILITARY DEFENSE ORGANIZATION

PART I—A FRAMEWORK FOR IMPROVING NONMILITARY DEFENSE ORGANIZATION

MCKINSEY & Co., INC.,
MANAGEMENT CONSULTANTS,
Washington, D. C., December 31, 1957.

HON. PERCIVAL F. BRUNDAGE,
*Director, Bureau of the Budget,
Executive Office of the President,
Washington, D. C.*

DEAR SIR: We submit herewith our report entitled "A Framework for Improving Nonmilitary Defense Organization." This report presents the findings and recommendations resulting from phase I of the study we were asked to undertake by your letter of November 27, 1957.

OBJECTIVES OF STUDY

Your letter directed that we—

1. Examine existing organizational arrangements for the conduct of the Federal Government's defense mobilization and civil defense functions and ascertain the problems resulting from these arrangements.
2. Consider possible alternative solutions to these problems.
3. Recommend improved organizational arrangements for the conduct of these functions.

WHAT WE HAVE DONE

To gain an understanding of existing organizational arrangements, and the problems they pose, we—

1. Assembled and analyzed materials describing the roles, functions, and programs of both the Office of Defense Mobilization and the Federal Civil Defense Administration. These materials included the basic legislation, Executive orders, proposed budgets, current program statements, national mobilization and civil defense plans, and delegations of responsibilities to other Federal departments and agencies.
2. Interviewed officials in ODM, FCDA, the Bureau of the Budget, and various delegate departments and agencies such as the Department of Health, Education, and Welfare, and the Housing and Home Finance Agency. The names of the officials interviewed during this phase of the study are set forth in appendix A.

On the basis of these sources of data we have pictured in chapter 1 of the accompanying report the nature of the organizational problems. In chapter 2 we have summarily described those proposals that have been offered to meet the organizational problems. In chapter 3 we present conclusions reached during this preliminary study and recommend a course of action that should be taken at this time to insure orderly progress toward an improved organizational framework for nonmilitary defense.

SUMMARY OF CONCLUSIONS

In summary the accompanying report recommends that a statement be developed for inclusion in an early Presidential message which will indicate:

1. The President recognizes that overlap and duplication limit the effectiveness of the present organizational arrangements for conducting nonmilitary defense functions (i. e., defense mobilization and civil defense functions).

2. He further recognizes that needs for nonmilitary defense have been changed by advances in military technology; the threat now confronting the Nation necessitates reconsideration of assumptions underlying legislation and Executive orders which created existing organizational arrangements.

3. He considers the Nation's nonmilitary defense to be of vital importance and he proposes to ask the Congress to vest in him certain responsibilities and authorities now vested by statute in other officials of the executive branch.

4. He believes it is essential to the safety of the Nation that the Federal Government have an effective, dynamic organization for nonmilitary defense. The organization must be one to which all may look for guidance and one which will insure that the coordinated might of the Federal, State, and local governments is at all times ready to cope with emergencies that enemy action might create.

5. He has directed that studies of existing organizational arrangements be made and that, when these are completed, he will suggest to the Congress such legislation as may be required.

The inclusion of such a statement in a Presidential message implies that it will be essential to establish, within the Executive Office of the President, an agency to aid him in formulating policies and in coordinating planning for the whole gamut of nonmilitary defense functions.

Further study is needed to determine the role of such an Executive Office agency. Additional study is also required to identify the operating or specialized functions that must be carried out by Federal departments or agencies in accordance with policies set by the President, and to ascertain where such functions can best be performed. Four alternative organizational assignments of these functions warrant consideration:

1. To a separate nonmilitary defense operating agency (such as, or similar to, FCDA).
2. To other existing departments and agencies.
3. To an Executive Office agency.
4. To a combination of two or more of the above.

OBJECTIVE OF SECOND PHASE OF STUDY

Analyses completed during phase I have laid the bases for developing concrete proposals for improving the organizational arrangements for the conduct of the Federal Government's defense mobilization and civil defense functions. We plan to develop, in the course of phase II of this study, a series of memorandums that will include such proposals. These memorandums will—

1. Analyze in detail the major areas of defense mobilization-civil defense activity and determine for each of these areas—

(a) The nature of the function to be performed.

(b) The most appropriate distribution of these functions (1) to the existing departments and agencies, (2) to an Executive Office agency, or (3) to a separate agency such as, or similar to, the present FCDA.

2. Describe the role and basic internal organization of an Executive Office agency to assist the President in formulating policies for defense mobilization-civil defense programs, and in coordinating the activities of and in providing leadership to Federal departments and agencies.

3. Describe the role of a separate civil defense agency, if one is found to be necessary, including the general contour of its internal organization-structure.

4. Set forth the relationships that should prevail in the field among Federal departments and agencies having defense mobilization-civil defense responsibilities.

In developing these memorandums we will seek the advice and suggestions of members of the staffs of ODM, FCDA, other Federal departments and agencies, and the Bureau of the Budget. We look forward to the opportunity of developing, with their aid, recommendations that will serve to facilitate their accomplishment of vital governmental functions.

Respectfully submitted.

McKINSEY & Co., Inc.

A FRAMEWORK FOR IMPROVING NONMILITARY DEFENSE ORGANIZATION—BUREAU OF THE BUDGET

CONTENTS

The problem :

- Division of responsibilities.
- Problems created by present arrangements.
- Developing and testing master plans.
- Planning for continuity of government.
- Planning for mobilization and utilization of resources.
- Reducing urban and industrial vulnerability.
- Coordinating activities of Federal agencies.
- Summary of problems.

Causes of the problem and solutions proposed :

- Underlying causes.
 - Revolution in technology of warfare.
 - Impact on nature of nonmilitary defense.
 - Inseparability of nonmilitary defense tasks.
- Recognition of need for change.
- Proposals for realigning ODM-FCDA responsibilities.
- Proposals for an executive department.
- Proposals for centralizing certain responsibilities.

A framework for improved organization :

- Guiding principles.
- Appraisal of alternative concepts.
 - The dual-command concept.
 - The executive-department concept.
 - The Executive Office concept.
- General conclusions developed to date.
 - Vesting responsibilities in the President.
 - Establishing a central agency in the Executive Office.
- Recommended course of action.

APPENDIX

List of officials interviewed in connection with phase I of study.

A FRAMEWORK FOR IMPROVING NONMILITARY DEFENSE ORGANIZATION—BUREAU OF THE BUDGET

1. THE PROBLEM

DIVISION OF RESPONSIBILITIES

The major responsibilities of the executive branch for developing policies and coordinating planning in nonmilitary defense¹ fields are distributed between two agencies—the present Office of Defense Mobilization (ODM), established in the Executive Office of the President by Reorganization Plan 3 of 1953, and the Federal Civil Defense Administration (FCDA), created as an independent agency by the Federal Civil Defense Act of 1950 (Public Law 920). Both agencies were created shortly after this Nation had suffered the experiences of World War II and the Korean war.

ODM is primarily responsible for directing and coordinating all mobilization activities of the executive branch of the Government, including those related to production, procurement, manpower, stabilization, transportation, and telecommunications activities and resources. The Director is also charged with advising the President on the coordination of the mobilization of all resources to meet civilian as well as military needs.²

FCDA is primarily responsible for the development, coordination, guidance, and leadership of a national program of civil defense designed to protect life and property in the United States from attack. Public Law 920 vests in State and local governments primary responsibility for civil defense activities within their political jurisdictions. During an emergency declared by the President or

¹“Nonmilitary defense” is used in this report to depict the broad sweep of civilian activities which are conducted for preparedness, defense, or survival, and recovery.

² See Reorganization Plan 3 of 1953 and Executive Orders 10461 of June 17, 1953, and 10480 of August 14, 1953.

Congress, the Administrator of FCDA is authorized to procure by condemnation or other means any materials needed for civil defense; to coordinate and direct, for civil defense purposes, the relief activities of other Federal departments and agencies; to employ personnel without regard to civil-service laws; and to provide financial and other assistance to State and local governments and individual citizens.³

ODM and FCDA both necessarily utilize other departments and agencies in carrying out their responsibilities. Hence, each makes delegations to or establishes working agreements with these other agencies. ODM's delegations are made directly; FCDA's require approval of the President. Each is also responsible for providing these agencies with continuing policy guidance and for coordinating their respective assignments. In addition, ODM seeks to coordinate the activities of Federal departments and agencies in the field through representatives in 10 regional areas; FCDA similarly coordinates the activities of Federal departments and agencies in the field, and stimulates civil defense planning by State and local governments through personnel assigned to seven regional offices.

PROBLEMS CREATED BY PRESENT ARRANGEMENTS

With increasing frequency Federal officials and observers alike have questioned the effectiveness of the present organizational arrangements for conducting these nonmilitary defense tasks—mobilizing the economy and protecting the lives and property of our citizens.⁴ Nearly all officials with whom we consulted feel that the simultaneous efforts of ODM and FCDA to provide policy guidance and to coordinate defense mobilization and civil defense activities impede the effective achievement of an adequate nonmilitary defense for this country. This unfortunate result accrues from the fact that ODM and FCDA in carrying out their respective responsibilities simultaneously perform similar or integrally related activities and place duplicating or conflicting assignments on other Federal departments and agencies.

Five major areas have been identified in which ODM and FCDA activities overlap. These areas involve the—

1. Developing and testing of master emergency nonmilitary defense plans.
2. Planning for the continuity of Government activities and services.
3. Planning for the mobilization and utilization of resources.
4. Reducing vulnerability of urban areas and industrial facilities.
5. Coordinating nonmilitary defense activities of other Federal agencies.

DEVELOPING AND TESTING MASTER PLANS

Under Reorganization Plan 3 of 1953, a primary objective sought by the President was to "enable one Executive Office agency to exercise strong leadership in our national mobilization effort, including both current defense activities and readiness for any future national emergency."⁵ In fulfilling these broad responsibilities, the Director of ODM must develop, with the assistance of other Federal agencies, planning assumptions and general mobilization plans. Illustrations of these assumptions and plans are found in mobilization plans assuming massive attack, and, alternatively, assuming limited warfare, and in plans for the establishment of temporary Federal agencies to be created in an emergency.

FCDA, however, has been vested by law with equally broad responsibilities—preparing national plans and programs and sponsoring such plans for the civil defense and the rehabilitation of the United States after attack. FCDA must maintain close-working relationships with State and local government officials, as well as with other Federal agencies to discharge its responsibilities. In dealing with State and local governments, it cannot divulge ODM's plans because they bear security classifications. Hence FCDA must develop unclassified planning assumptions to guide State and local officials. Furthermore, it must also prepare general civil defense or nonmilitary defense plans (and is presently developing a national plan) because the duty to take steps for protecting life and property comprehends all sectors of our Nation and economy except military operations.

³ See the Federal Civil Defense Act, Public Law 920, 81st Cong.

⁴ See Civil Defense for National Survival, 24th Intermediate report of the House of Representatives Committee on Government Operations, July 27, 1956; Report of Project East River, July 1952, and the 1955 review of this project; A Program for the Nonmilitary Defense of the United States, a study issued by the National Planning Association, May 1955.

⁵ See the message from the President of the United States transmitting Reorganization Plan 3 of 1953 to the Congress under date of April 2, 1953.

Both ODM and FCDA must test plans for their adequacy and completeness and more particularly must test the capability of Federal agencies to function effectively in an emergency. ODM is responsible for promoting and monitoring the planning and execution of integrated tests or the Operations Alert for this purpose. It does so through an interagency test group chaired by an ODM representative. FCDA, among other Federal agencies, participates in the work of this group. In the conduct of these tests, it has been found necessary for ODM to have direct relations with representatives of the State civil defense directors. Some of the other difficulties experienced by ODM and FCDA in the activities generated by these tests of emergency plans are described in succeeding sections.

In day-to-day planning, however, lack of uniform, consistent, and comprehensive guidance leads to confusion that prevents the concerted action required by all levels of government. This is illustrated by a finding of the House of Representatives Committee on Government Operations:⁶

"The FCDA guide manuals for the studies outlined 19 proposed areas of inquiry relating to evacuation. The New York and California groups, whom the subcommittee queried in some detail, had reorganized these proposed study areas. Thus the California group added categories which were omitted or only implied in the FCDA manual, such as studies of shelter availability in the target areas, food resources, industrial resources, medical aid, and military plans and organizations.

"Both the New York and California studies added a category on nuclear weapons effects. 'These things are necessary,' said William L. White, director of the California project, 'both to build the planning assumptions and also to test plans which might be made.'

"Apparently, then, different projects are developing their own planning assumptions without any assurance that they will conform to those made elsewhere or with the relevant military intelligence and weapons technology."

These inconsistencies occurred because civil defense planning to protect lives and property must comprehend the mobilization of resources and nearly all facets of the economy. However, with two agencies of the executive branch having mandates requiring them to prepare comprehensive planning assumptions and nonmilitary defense plans, unnecessary overlap, duplication of effort, and inconsistencies cannot be eliminated, and gaps in needed nonmilitary defense plans and programs inevitably result.

PLANNING FOR CONTINUITY OF GOVERNMENT

Until 1956 officials of both ODM and FCDA felt their respective agencies were responsible for taking steps to facilitate continuity of government activities at local levels in event of an emergency. After discussion of the problem by members of both agencies, FCDA agreed to accept responsibility for assisting State and local governments and ODM agreed to continue sponsorship of such a program for the Federal Government.⁷

Consequently, each agency develops and carries out similar programs affecting different levels of government. This division of responsibility has created, or will create, such problems as the following:

1. It has consumed staff time in coordinating plans and testing their feasibility and effectiveness. For example, ODM is responsible for having identified and for cataloging essential functions to be performed by Federal agencies in an emergency and staff requirements therefor. FCDA delegates postattack (as well as preattack) functions to other agencies. It must assure itself that delegated functions are adequately provided for because it is ultimately responsible for all civil defense activities. Therefore, the staffs of FCDA and ODM must continually work together in time-consuming collaboration in relating their own plans and those of other agencies.

2. Divided responsibility can result in conflicts between Federal and State or local agencies over the selection of their respective relocation sites. No major conflicts have occurred because FCDA's plans for carrying on its State and local programs were not finalized until September 19, 1957, when it issued Advisory Bulletin No. 216. In the future, if a local government agency desires a relocation site that has been selected by a Federal agency, the conflict must be resolved

⁶ Civil Defense for National Survival, 24th intermediate report of the House of Representatives Committee on Government Operations, July 26, 1956, p. 36.

⁷ FCDA's responsibilities with respect to State and local governments were formally delegated to it by ODM by its Defense Mobilization Order (DMO) T-18, January 11, 1956.

with two Federal agencies. This triangular relationship will be confusing to State and local officials and will delay decisions.

3. It will not insure that adequate provisions will be made for the most effective integrated working relationships between all levels of government that must exist in an emergency. For example, relocation sites of Federal and State agencies may be so situated as to create complicated communications problems because no single agency is responsible for insuring that ideal locations are chosen by all levels of government.

Another illustration of the need for better integration is suggested by ODM's current consideration of how the broad police power of State governors may be utilized for maintaining law and order while at the same time making available the resource mobilization authorities, manpower, material, and services of the Federal Government at the points of need.

PLANNING FOR MOBILIZATION AND UTILIZATION OF RESOURCES

Uncertainties in the extent of ODM's authority for carrying out programs to mobilize resources—manpower, goods, and production facilities—and particularly to authorize their use in an emergency⁸ resulted in the so-called basic responsibilities paper⁹ or agreement. Fundamentally this paper is premised on the assumption that planning for the (a) military, (b) civil defense, relief, and rehabilitation, and (c) resource mobilization (logistical support) problems resulting from a massive attack on the continental United States is separable and can be carried on simultaneously by separate agencies.

The agreement assigns to FCDA responsibility for directing the efforts of Federal, State, and local governments, as well as national relief organizations, in all civil defense, relief, and rehabilitation matters. In addition to directing police, fire, sanitation, and similar protective activities, FCDA is responsible for providing and distributing or rationing food, clothing, shelter, and medical-care items or services, and for restoring public facilities and utilities basic to the resumption of commerce and industry.

On the other hand, ODM's role under the basic responsibilities paper is to provide logistical support to military and civilian agencies. It will "(a) mobilize resources and direct the production required to meet military requirements * * *, essential civilian requirements * * *, and nonmilitary requirements for foreign areas * * *; (b) direct economic stabilization programs; and (c) in order to accomplish the objectives set forth under (a) and (b) will direct programs for allocation of resources, including the adjudication of conflicting claims for manpower, production, energy, fuel, transportation, telecommunications, housing, food, and health services."

ODM's foregoing logistical support responsibilities exclude, among other things, "civilian use items presently existing in the civilian economy, in civil defense stockpiles, in the possession of civil defense units, and in the civilian distribution system which can be directly utilized for civil defense, relief, and rehabilitation purposes without further processing."

Experience of ODM, FCDA, and the delegate agencies, since the basic responsibilities paper was issued, has demonstrated that the distribution of responsibilities provided for is unworkable. This conclusion is testified to by officials of both agencies. It is, as well, demonstrated by (a) the conflicting responsibilities that remain and (b) duplication in day-to-day operations.

1. *Conflicting responsibilities.*—Should a devastating nuclear attack on this Nation occur, the major task would be to pick up the pieces. Is this FCDA's responsibility? Yes, but ODM's broader responsibilities, that cannot be abdicated by the informal agreement registered in the basic responsibilities paper, comprehend the duty to take appropriate actions for mobilizing and authorizing the use of all available resources in any emergency.¹⁰

⁸ Sec. 101 (a) of Executive Order 10480 of August 15, 1953, authorizes the Director of ODM to direct, control, and coordinate all mobilization activities of the executive branch.

⁹ See memorandum to heads of departments and agencies from the Director of ODM, January 31, 1957, transmitting among other items, Basic Responsibilities After Attack on the United States, as revised with explanatory footnotes, January 12, 1957. This division of responsibilities was originally agreed upon and approved on January 3, 1956, for planning purposes by the Secretary of Defense, Chairman of the Joint Chiefs of Staff, Director of ODM, Administrator of FCDA, and the President. "Planning purposes" is defined to include, among other things, making delegations and assignments of functions insofar as current legislative authority will permit.

¹⁰ See Reorganization Plan 3 of 1953 and Executive Orders 10461 of June 17, 1953, and 10480 of August 14, 1953.

2. Duplicating operations.—Because both ODM and FCDA are concerned with control and utilization of resources after an attack, each has organizational units that are responsible for planning relating to the mobilization and control of the same resources. In fact, some divisions and activities of ODM, which is organized basically along resource lines, are paralleled by some offices or activities of FCDA which have the same or similar areas of interest.

Both ODM and FCDA are or will be carrying out similar activities in the health, manpower, transportation, civilian, and governmental requirements areas, among others. To fulfill their responsibilities under existing legislation in the manpower, transportation, and other resource areas, both organizations must accumulate data in each area from similar sources. Estimates of manpower and materials that will be required during and after an emergency and those likely to be available must be compared. If potential shortages in specific areas (e. g., doctors) are revealed, actions must be initiated to fill the gaps.

Overlaps similarly occur in the stabilization and rationing fields. FCDA is responsible under the basic responsibilities paper for essential civilian consumer rationing, but ODM must direct economic stabilization programs. Can rationing of food and clothing be divorced from other activities designed to achieve economic stabilization?

With respect to this question, and related problem areas, the report of ODM's Mobilization Policy Advisory Committee on Operation Alert 1957 states: "The jurisdiction of FCDA versus the RMC (ODM's Regional Mobilization Coordinator) over inventories of finished goods in the distribution chain needs to be clarified, and the relative roles of the two agencies in rationing and stabilization need further clarification." In fact, even in these test exercises inseparability of the tasks is accentuated. The FCDA Intraagency Report on Operation Alert 1956 states: "The conduct of the exercise by phases rather than by a compression of time appeared to be validated * * *. On the matter of joint exercises with ODM, considerable confusion seems to obtain and some separation, at least of the FCDA and ODM phases, seems indicated."

Similarly questions over utilization of Federal Government personnel during emergencies remain unresolved. Under ODM's concept many present Federal officials have assignments to temporary emergency control agencies. FCDA is planning to call for the services of some of these officials to fulfill its needs for specialist help in emergencies.

REDUCING URBAN AND INDUSTRIAL VULNERABILITY

In January 1956, ODM delegated to FCDA under DMO I-18 responsibility for "the development and coordination of plans and programs for the reduction of urban vulnerability, including coordination at the metropolitan target zone level of dispersion, urban redevelopment, and other programs and measures, capable of making a contribution to the reduction of urban vulnerability." This, theoretically, centralized responsibility for these activities in FCDA.

However, in DMO I-19, ODM established policy and criteria for dispersion and protective construction and distributed responsibilities for such programs to FCDA and other Federal agencies. But dispersion and protective construction are important features of the program for reducing urban vulnerability. Hence, it seems apparent that DMO I-19 clouded the clear-cut delegation granted FCDA by DMO I-18.

As a result of DMO I-19, ODM, Department of Defense, Commerce, and FCDA are carrying out programs relating to dispersion and protective construction. Their programs involve contacting and offering guidance to State and local officials, industrial officials, and other government agencies. The policies and instructions of these several agencies are not uniform or consistent or well known by all concerned. For example, in one case a Federal agency had planned its emergency relocation site in a town which, under FCDA target criteria, was a critical target.

DMO I-19, theoretically at least, offered a base for establishing uniform criteria. However, it did not eliminate the multiple, and sometimes confusing, contacts being made at the local level and with industry by Defense, Commerce, and FCDA.

COORDINATING ACTIVITIES OF FEDERAL AGENCIES

Nearly all major agencies of the Federal Government are responsible for conducting activities related to nonmilitary defense as part of their regular peacetime functions. In addition, they carry out nonmilitary defense activities under delegations or working agreements with both FCDA and ODM.

Under existing organizational arrangements some conflicts arise out of the difficulty of distinguishing between regular, peacetime functions and delegated responsibilities. For example, the House Committee on Government Operations reported:

"The agencies cannot readily distinguish the delegated activities from those they normally pursue since all their work has some bearing on civil defense. For example, the Department of Agriculture decided to absorb \$162,000 of civil defense costs for 1956 under its own budget until it could know more clearly the scope of the tasks delegated by FCDA. Under Secretary of Agriculture True D. Morse said that these were considered normal Department activities."

It reported also that "Dr. Scheele stated to the subcommittee that the Public Health Service worked hard in this field before there was an FCDA and before the Service ever had a delegation. In fact, the Public Health Service exercised its own initiative in pressing for the delegation * * *"

In addition, as then Assistant Secretary of Labor, Rocco C. Siciliano, pointed out to the House committee:

"The delegated agencies find it difficult not only to distinguish between their own and delegated civil defense activities, but to distinguish between delegations received from FCDA for civil defense purposes and from ODM for defense mobilization purposes * * *"

For example, the following table lists delegations by FCDA and ODM, to four Federal agencies:

Delegate agency	Area	Covered by—	
		FCDA delegation	ODM delegation
Agriculture.....	Food.....	No. 2.....	DMO I-9.
Housing and Home Finance.....	Housing.....	do.....	DMO I-14.
Interior.....	Fuel.....	No. 3.....	DMO I-13.
Labor.....	Manpower.....	No. 2.....	DMO I-10.

This summary indicates, at least, areas of common interest. More careful analysis of the delegations suggests that FCDA and ODM place similar responsibilities on these and other Federal agencies, using different orders and words, and each requires periodic reports.

John J. Chapman, of the Housing and Home Finance Agency, for example, told the House Committee on Government Operations that the HHFA has the job of "dovetailing similar and parallel responsibilities" assigned by FCDA and ODM. And former FCDA Administrator Val Peterson testified: "I will admit these delegations are crisscrossing and confusing."

Recognizing these difficulties, both agencies have endeavored to resolve the seeming overlap and confusion. In 1956 a joint committee was created to study and revise unclear or conflicting delegations. Officials of both agencies advise that the joint committee's efforts have been unsuccessful.

In addition, to facilitate the coordination of effort in nonmilitary defense activities among Federal agencies, ODM has the Defense Mobilization Board and more recently (June 1957) the Emergency Resources Board; FCDA has a Civil Defense Coordinating Board.¹¹ The membership of each is shown in the following table.

The existence of three Boards with similar and related responsibilities, the size of each, and the variety of other more compelling day-to-day responsibilities of the agency representatives raise doubts as to whether these bodies can achieve coordinated actions by the departments and agencies. Different individuals from the same agency may sit on each Board. Furthermore each Board's activities are oriented to different aspects of nonmilitary defense planning. DMB looks at the long-range logistical support problems; the Emergency Resources Board considers unresolved problems that arose as a result of Operation Alert

¹¹ The Emergency Resources Board was established only to serve as a coordinating body for Operation Alert 1957, but continues in existence (according to ODM's Exercise Progress and Evaluation Report No. 10 on Operation Alert 1957) "for the purpose of applying itself to the further consideration of unresolved problems." Additional arrangements for providing close-working relations are: periodic joint ODM-FCDA staff meetings, ODM's mobilization plans group for coordinating and revising plans and ODM's interagency plans group for test exercises.

1957; the Coordinating Board studies civil defense, relief, and rehabilitation problems. In some instances these Boards deal separately with problems that require coordinated resolution. No single forum exists where misunderstanding and confusion can be resolved.

Two of these Boards have counterparts in the field. ODM has Regional Mobilization Committees, composed of the representatives of Federal agencies, in each of its 10 regions.

Departments and agencies	Defense Mobilization Board	Civil Defense Coordinating Board	Emergency Resources Board
Bureau of the Budget.....		X	
Office of Defense Mobilization.....	X	X	X
Department of State.....	X	X	X
Department of Defense.....	X	X	X
Department of the Treasury.....	X	X	X
Department of the Interior.....	X	X	
Department of Agriculture.....	X	X	
Department of Commerce.....	X	X	
Department of Labor.....	X	X	
Post Office Department.....		X	
Department of Health, Education, and Welfare.....	X	X	
Department of Justice.....		X	
Federal Reserve System.....	X		X
Federal Civil Defense Administration.....	X		X
Federal Power Commission.....		X	
General Services Administration.....		X	
Housing and Home Finance Agency.....		X	
Small Business Administration.....	X		
Veterans' Administration.....		X	
Atomic Energy Commission.....		X	X
Council of Economic Advisers.....			X
Emergency Economic Agency.....			X
Emergency Energy and Minerals Agency.....			X
Emergency Food Agency.....			X
Emergency Housing Agency.....			X
Emergency Manpower Agency.....			X
Emergency Production Agency.....			X
Emergency Stabilization Agency.....			X
Emergency Transport Agency.....			X

These committees are chaired by regional mobilization coordinators and serviced by ODM's part-time skeleton regional staffs. The coordinators and staffs are made up of individuals borrowed from other Federal agencies. FCDA has regional coordinating boards, composed in many instances of the same representatives of Federal agencies, in each of its seven regions. These boards are serviced by the FCDA regional directors and their full-time staffs.

During the preattack period these regional boards have no clear demarcation of responsibilities. Members testify that the activities and discussions of these boards overlap markedly. In the postattack period, the responsibilities of each, and of the regional ODM coordinator and the FCDA regional director, are so unclear as to constitute a major cause of organizational confusion and friction. This lack of clarity was highlighted during the 1957 Operation Alert when an ODM regional mobilization coordinator proposed that he be relieved and his responsibilities be assigned to the regional administrator of FCDA to avoid conflicts and confusion. The need for resolution of these conflicts in the field is clearly recognized. The FCDA Intraagency Report on Operation Alert 1956 commented: "It is questionable whether the ODM regional coordinator should exercise operating or determining authority during an attack situation * * * both (ODM and FCDA regional officials) recognized conflicts in operations of FCDA and ODM." Similarly ODM's Exercise Progress and Evaluation Report No. 10 on Operation Alert 1957 states: "The development of better mechanisms at the regional and local levels for the coordinated implementation of programs" is required.

The urgency of this need becomes more apparent when it is recognized that this lack of clearly defined authority in the field leads to two or three channels of communications to the President. This, in turn, burdens the President and his assistants with problems that require the correlation of numerous factors before a decision should be made.

Even the task of keeping the President and his assistants informed is complicated. ODM's Exercise Progress and Evaluation Report No. 10 on Operation Alert 1957 states: "The functioning under disaster conditions, of the mechanism

designed to advise the President, such as the Cabinet, the National Security Council, agency heads, and the whole structure of interdepartmental committees, through which the decisionmaking process is carried out needs improvement." In part, this is a mechanical problem because "the physical impracticability of providing the security safeguards for conferences by telephone and TV mediums is a major barrier." But the basic problem is attributable to the complex channels of communications that exist or, conversely, to the lack of a unified command structure designed and recognized in advance of emergency. The problem is recognized by those concerned; but existing organizations are not equipped to resolve it.

SUMMARY OF PROBLEMS

The foregoing analyses make clear that in most areas of nonmilitary defense planning, confusion or duplication exists among the organizations involved in that planning. No precise and accepted definition indicates who shall be responsible for essential activities in the event of an attack. In total, this Nation lacks the organizational arrangements needed for developing a consistent, well-defined program for surviving and recovering from a massive nuclear attack.

Most officials consulted—particularly the Director of ODM and the Administrator of FCDA—recognize this lack and earnestly seek means of overcoming the deficiencies patent in existing organizational arrangements. Many proposals have been advanced by the Congress, as well as the executive branch, as to how these organizational arrangements should be improved.

Determination of the course which organizational improvement should follow must be founded on objective consideration of the root causes of the existing problem. Then alternative organizational proposals can be weighed, and principles to guide the design of improved organizational arrangements can be formulated. This succession of tasks—determination of causes, the weighing of alternative proposals, and the formulation of principles to guide the course of organizational improvement—will be undertaken in the two succeeding chapters.

2. CAUSES OF THE PROBLEM AND SOLUTIONS PROPOSED

UNDERLYING CAUSES

The existing organizational arrangements for nonmilitary defense are founded on legislation enacted in the 1947-50 period.¹² They were designed primarily on the basis of World War II experience and were modified in relatively minor fashion¹³ to reflect Korean war experience and to recognize the threat posed by limited atomic attack.

(a) *Revolution in technology of warfare.*—Since these organizational arrangements were established, techniques of warfare and enemy capabilities have changed drastically. The atomic weapons that exist in 1957 possess a destructive power many times greater than the bombs available in 1952 and a thousand times greater than the bomb dropped on Hiroshima. Moreover, these weapons can be delivered on targets that were beyond reach in 1946 and in a fraction of the time required in 1952. The existence of these capabilities—vastly greater destructive power and the ability to deliver such weapons speedily on any target in this country—poses an unprecedented threat to the United States. The Nation may be in danger of being hit with little or no warning by a nuclear attack that threatens our survival.

(b) *Impact on nature of nonmilitary defense.*—The changed nature of the threat, and its effect on earlier concepts of civil defense and defense mobilization, has been recognized by many individuals in and out of Government. The tin hat and sand bucket civil defense measures of former years are outdated. Outdated too is the heavy reliance on defense mobilization concepts in which it was assumed that the Nation would have time after hostilities start to assemble, control, and allocate its resources.

The staffs of FCDA, ODM, and other agencies engaged in nonmilitary defense planning have perceived the changing needs which have resulted from the changed threat upon the Nation.

¹² The National Security Act of 1947, the Federal Civil Defense Act of 1950, and the Defense Production Act of 1950.

¹³ Reorganization Plan 3 of 1953.

For example, in the past 5 years, the concepts underlying mobilization planning have undergone an evolution so rapid and so significant as to be almost revolutionary. This evolution may be summarily pictured as follows:

1. The concept emerging from World War II and the Korean war called for rapid conversion of productive capacity from peacetime to wartime bases supplemented by stockpiles of critical and strategic materials and equipment.

2. The succeeding concept required a mobilization base that was ready to produce weapons needed. This production would come from "hot," "warm," and "standby" lines.

3. Emergence of the "military forces in being" concept permitted modification of the mobilization base expansion goals, and stockpiling objectives for the first phase of a general war. Its emergence also emphasized selected dispersion and continuity of production programs for the second phase, a war of attrition.

4. Finally, more current concepts call for increased reliance on civilian forces in being, following an attack and the stocks and productive capacity for their survival and rehabilitation. The concept focuses attention on the mobilization base for critical survival items, and the development of statistical tools to manage the job.

Civil defense concepts have undergone a similar evolution. During this same period, these concepts have evolved through substantially the following sequence:

1. First, primary reliance was placed on the ability of the people to "Duck and Cover,"¹⁴ that is, individuals were relied on to find their own protection.

2. Next, the concept was adopted to rely on "volunteer" groups of individuals trained as "civil defense workers."

3. Later, prevailing concepts called for reliance upon evacuation of the population from target areas prior to attack.

4. Now, concepts are evolving which call for—

(a) Construction of mass shelters against blast and/or fallout;

(b) Urban and industrial vulnerability reduction;

(c) Identification of critical survival items and the actions needed to insure their availability after attack.

This summary and topical description of the evolution of concepts pictures a trend; it does not attempt to state precisely the policies that prevailed. It suffices to suggest that organizational arrangements designed to carry out earlier concepts are unsuited for the administration of current concepts of nonmilitary defense.

(c) *Inseparability of nonmilitary defense tasks.*—The evolution of thinking as to what constitutes "defense mobilization" and "civil defense," in terms of the kind of war that can be foreseen, makes clear that these two activities are no longer separate and mutually exclusive. The potential magnitude of the devastation that could be wrought by a nuclear attack makes manifest that the Nation's total energies and resources would be dedicated to human survival.

Observers of the activities of ODM and FCDA, with increasing unanimity, testify that an organizational arrangement founded on the premise that defense mobilization activities are distinctive and separable from civil defense activities is invalid.¹⁵ They opine that the assignment of organizational responsibilities according to time periods (the survival period versus the rehabilitation period), geographical areas, or kinds of resources is unworkable.¹⁶ What is planned for or would be done in the earlier period inevitably determines what can be done subsequently. Survival, it is contended, will require that the unscathed and devastated areas and all resources be treated in an integral manner.¹⁷

¹⁴ This is the title of a popular pamphlet produced by the National Security Resources Board in 1950 and taken over by FCDA when it was created.

¹⁵ See Civil Defense for National Survival, 24th intermediate report, Committee on Government Operations, U. S. House of Representatives, July 27, 1956, pp. 2 and 3: "Civil defense must be construed in a broad sense, encompassing all those tasks necessary to prepare the Nation to withstand and overcome the ravages of enemy attack * * * * The subcommittee sees no sensible distinction between the civil defense planning activities of ODM and FCDA and believes that these related activities should be merged."

¹⁶ See the 1955 Review of Project East River, sponsored by ODM, DOD, and FCDA. "Much of the work of these two agencies (FCDA and ODM) is most intimately interrelated, and to attempt to separate them by subject or by time phase is artificial and leads to confusion and duplication."

¹⁷ See memorandum for Mr. Gordon Gray, from the Mobilization Program Advisory Committee, November 15, 1957 (MPAC Report No. 33): "* * * The Committee unanimously agrees that all parts of this concept are so interrelated that they cannot wisely be separated. For example, the Committee views the whole problem of dealing with people as casualties or sufferers after an attack as simply one phase of resource management, not as a separable, discreet problem of 'civil defense.'"

Hence, accumulating evidence suggests that a major cause of difficulties relating to existing organizational arrangements for nonmilitary defense is the obsolescence of the idea that these two activities can be administered by separate agencies.

RECOGNITION OF NEED FOR CHANGE

In recent years the fact that existing organizational arrangements and legislation are outmoded has come to be recognized by a number of groups concerned with the problem. The Committee on Government Operations of the House of Representatives, the President's Advisory Committee on Government Organization, the Bureau of the Budget, the Federal Civil Defense Administration, the Office of Defense Mobilization, and public groups such as the National Planning Association have all considered proposals for resolving the confusion that now exists in the organizational arrangements for nonmilitary defense. In the remaining sections of this chapter the major alternative solutions which have been proposed will be described so that their utility may be evaluated in the light of the causes of the organizational problem.

PROPOSALS FOR REALIGNING ODM-FCDA RESPONSIBILITIES

One proposal that has been advanced to reduce the present confusion over the respective roles of FCDA and the Office of Defense Mobilization involves simply a realignment of responsibilities now assigned these two agencies. This realignment would be based on the assumption that responsibility for the direction and coordination of Federal Government activities during the attack and immediate postattack periods would rest with FCDA and the responsibility for the longer range planning would rest with ODM.

On the basis of this concept it has been proposed that the following responsibilities be transferred from ODM to FCDA:

1. Direction and coordination of planning and readiness steps, such as preservation of records, related to the continuity of the Federal Government during an attack on the United States. FCDA already has responsibility for advising and assisting State and local governments in this area.
2. The conduct of operational planning and testing (Operation Alert).
3. The functions of the National Damage Assessment Center.

The following responsibilities would be transferred from FCDA to ODM:

1. Long-range, postattack planning in the areas of restoration and rehabilitation.
2. Distribution controls.
3. The determination of manpower and material necessity to meet essential consumer requirements.

A second and similar proposal would leave FCDA and ODM with the functions now assigned to them. However, it would place FCDA alongside ODM in the Executive Office of the President. This proposal is based on the assumption that FCDA must have Executive Office status to carry out its activities effectively through other departments and agencies. It is also felt that placing FCDA at the same organizational level as ODM will help both agencies in ironing out differences that occur and in reducing or eliminating duplications and overlaps.

PROPOSALS FOR AN EXECUTIVE DEPARTMENT

Another major group of alternative solutions suggests assigning most, if not all, of the Federal Government's nonmilitary defense functions to a new or to an existing executive department.

Basically, this proposal involves the placement of civil defense functions in an executive department. In one variation a new department would be created and its functions would encompass all functions now conducted by FCDA and those conducted by ODM, as well as the natural disaster functions now vested in the President by Public Law 875, 81st Congress., and delegated to FCDA by Executive order. In this proposal, the term "civil defense" would be defined as follows:

"In the broadest sense of the term, civil defense is conceived as dealing with the whole complex of nonmilitary activities necessary to prepare or 'mobilize' the economy against possible war, to survive and emerge from the ashes of attack, to maintain the continuity of government and essential production, to pro-

ceed toward partial recovery and then toward full resumption of peacetime pursuits".¹²

Other variations on this proposal involve placement of these civil defense functions in an existing department (e. g., Department of Defense, Department of Health, Education, and Welfare) rather than create another department.

In all variations of this proposal, an Office of Defense Mobilization would be retained as a staff arm of the President to coordinate military and civilian mobilization. These coordinating functions and activities have not been further defined.

PROPOSALS FOR CENTRALIZING CERTAIN RESPONSIBILITIES

A third group of proposals is based on the premise that the character of FCDA and ODM functions has changed in light of advances in weapons technology and enemy capabilities. These proposals, also, are based on the concept that the authorities and responsibilities that must be exercised in the field of nonmilitary defense are Presidential in nature.

These proposals would centralize in the Executive Office of the President all policy guidance and coordination of executive-branch activities in the field of nonmilitary defense. These proposals fall into two major groups:

1. *A single policy and coordinating agency and a separate civil defense operating agency.*—This group of proposals would place FCDA's and ODM's responsibilities and authorities for nonmilitary defense in the President. It would provide an Executive Office agency to aid the President in discharging these responsibilities. This Executive Office agency would be delegated, by Executive order, authority for central policy guidance and coordination over the whole range of the Federal Government's nonmilitary defense planning and readiness programs. There would continue to be an independent agency such as, or similar to, FCDA reporting directly to the President which would be responsible for such nonmilitary defense "operating" functions that were not delegated by the President to the regular departments and agencies.

A variation on this alternative is to have the nonmilitary defense "operating" agency report directly to the head of the new Executive Office agency which would be responsible for overall policy guidance and coordination of all defense mobilization-civil defense functions.

Another variation would place certain civil defense functions in a new Department of Urban Affairs, along with the functions now performed by the Housing and Home Finance Agency.

2. *A single policy and coordinating agency with no separate civil defense operating agency.*—This alternative would place FCDA's and ODM's responsibilities and authorities for nonmilitary defense in the President and abolish FCDA and ODM. A new agency in the Executive Office of the President would be created to which would be delegated, by Executive order, authority for central policy guidance and coordination over the whole range of the Federal Government's nonmilitary mobilization planning and readiness programs.

The new Executive Office agency would be responsible for, in addition to central policy guidance and coordination, whatever planning and "operating" or "specialized" functions of FCDA and ODM that could not be delegated by the President to existing departments and agencies of the Federal Government.

The variety of alternative solutions that have been proposed and the numerous sources from which they emanate reaffirm the existence of the problem depicted in chapter 1. Not all of the alternatives proposed, however, effectively recognize the root causes of this problem. Principles which grow out of the causes stated at the start of this chapter are presented in the succeeding chapter. These principles provide the basis for appraisal of the alternative solutions proposed, and for determining the course that organizational improvement should follow.

3. A FRAMEWORK FOR IMPROVED ORGANIZATION

In preceding chapters we have analyzed the problem created by existing organizational arrangements for the Federal Government's nonmilitary defense activities, set forth the causes, and depicted proposed solutions. From these analyses of the problem, its causes and proposed solutions, we have developed a set of principles to guide the formulation of improved organizational arrange-

¹² Civil Defense for National Survival, 24th Intermediate report of the House of Representatives Committee on Government Operations, July 27, 1956, p. 16.

ments. These principles, because of the limited nature of our studies to date, must necessarily be considered tentative. They will be tested and refined during phase II of our study.

GUIDING PRINCIPLES

Seven guiding principles are proposed. They are:

1. The job of nonmilitary defense cannot be divided effectively for organizational purposes on the basis of—
 - (a) Time phases, such as postattack survival and long-range recovery or rehabilitation.
 - (b) Geographical areas, such as damaged and undamaged areas.
 - (c) Subject or item, such as survival items (e. g., food, sanitation, medical, shelter) and recovery items (e. g., building materials).
 - (d) Types of wartime assumptions, such as limited war, world war without nuclear attack on the continental United States, or worldwide nuclear war.
2. The organizations that exist to provide for this country's nonmilitary defense must be capable of—
 - (a) Creating public awareness and understanding of the importance of nonmilitary defense; citizens must be helped to recognize that a nuclear attack would affect almost every aspect of our individual and national life.
 - (b) Effective and timely evaluation of various readiness measures; all alternative measures must be appraised promptly in terms of their costs, relative contributions to the reduction of the effects of an attack, their value in relation to proposed programs for military defense, and for the strengthening of our allies.
 - (c) Developing and conducting action programs that will reduce this Nation's vulnerability and increase its readiness to cope with the effects of an attack. Without such programs, chances for survival may become so remote that attempting to plan for it will become discouraging and plans will become quite meaningless.
3. The readiness of this country's nonmilitary defenses is of such vital significance to the Nation, and the actions that would have to be taken by Government in the event of attack are of such a character as to warrant continuous Presidential attention.
4. Time will not be available in the event of sudden attack to develop new organizations to cope with its effects. Whatever organizations may be required after attack will have to be established before the attack. Their plans for continuous postattack operations must be made in advance of attack.
5. Existing Federal, State, and local governmental machinery will, of necessity, constitute the basic structure to assemble, control, and manage available resources and provide essential services following the attack.
 - (a) Realistic plans must be built upon the established relationships between Federal, State, and local governments and upon the present capabilities, resources, and technical knowledge of these governments.
 - (b) The action agencies in event of attack should also be responsible for preattack planning.
 - (c) Regular departments and agencies of government should be used to the maximum in handling nonmilitary defense planning and readiness programs which fit into their established roles and capabilities; new organizations should be created only to perform functions for which no present organization exists.
6. There is a need for an organization to assist the President in the discharge of functions that will inevitably devolve on him. He must have a staff to assist him in formulating policies, in providing leadership, in evaluating the adequacy of planning and readiness programs, and in guiding and coordinating the nonmilitary defense efforts of the various Federal departments and agencies. Coordination of Federal departments and agencies is, by its very nature, a Presidential function; it cannot be carried out by an agency of equal status to those to whom responsibility is delegated for nonmilitary defense planning and preparation.
7. Organizational arrangements for nonmilitary defense must be so structured that they can be modified easily and quickly and changes occur in the concepts of war, in enemy capabilities and intentions, and in the technology of defense. Such changes must also be reflected continually in integrated national, regional, and local plans.

APPRAISAL OF ALTERNATIVE CONCEPTS

The various proposals described in the preceding chapter present, in summary, three alternatives concepts for organizing the nonmilitary defense activities of the Federal Government. Here we will describe each concept and test it by the principles that have been stated.

(a) The dual-command concept

This concept is founded on a belief in the separability of the defense mobilization and the civil defense functions, if not in character, at least in time. It assumes two lines of authority from the President to local levels, one for civil defense activities required during the attack and immediate postattack periods and one for the mobilization and control of resources required later for rehabilitation.

This concept is implicit in the proposals described on page 424 of the preceding chapter which call for modifying the existing distribution of responsibilities between ODM and FCDA. The proposals would permit both agencies to continue essentially as they are now, but FCDA would be responsible for planning and operations for the attack and immediate postattack periods and ODM for longer range planning and operations for the rehabilitation period.

Adoption of this proposed solution would provide the departments and agencies with a central point for coordination and policy guidance on some elements of nonmilitary defense; for example, on the collection and use of damage assessment data, and on operational planning and testing. It would make possible more consistent planning between Federal and State and local governments for the continuity of government.

The Administrator of FCDA feels that one of the major advantages of this alternative is that it would not be disruptive at this critical time. He is in the process of preparing a national civil defense plan. This, he believes, will provide for the first time clear direction and cohesiveness to civil defense and readiness programs at Federal, State, and local levels. Major changes in organization at this time, the Administrator believes, would disrupt development of this overall civil defense plan. The proposal advanced under this concept could be adopted simply by administrative agreement of ODM and FCDA; it could be acted upon immediately with no adverse effects on morale in the organizations; and it would not require Presidential or congressional approval.

This proposal, however, has serious disadvantages. Continuance of this organizational concept would mean that the Federal departments and agencies would still receive policy guidance and coordination from two agencies in such areas as manpower, housing, food, transportation, communications, and health.

The job of nonmilitary defense would be divided between two agencies, one responsible for the postattack period survival planning and the other for the long-range rehabilitation planning. The President, or a Presidential staff agency, would be left with the job of trying to divide the responsibilities by periods which nuclear warfare has made inseparable. These complications would in turn make the development and financial justification of an integrated and consistent nonmilitary defense program a cumbersome undertaking at best.

Adoption of this proposal would provide no single point in the executive branch for evaluation of the relative costs and benefits of various civilian readiness measures such as shelter construction, industrial dispersal, and stockpiling. Therefore, there would be no single agency to develop and coordinate a nonmilitary defense position for evaluation by the National Security Council in relation to foreign aid and military defense requirements.

Under this proposal, FCDA would continue to have major coordinating and directive authority over the other coequal agencies, an authority normally reserved for the President. Conflicting authorities over the use and control of resources in an emergency would still exist. This would result in continued uncertainty as to how the Federal departments and agencies and their personnel would be used in the event of attack on the United States. These uncertainties would probably result in the continuance of regional offices for both ODM and FCDA. This, in turn, would defer the resolution of the difficulties (described in ch. 1) created by the existence of separate field organizations.

In summary, this alternative would not solve the major problems that now beset the Federal Government's organizational arrangements for nonmilitary defense activities.

The source of the weaknesses of this organizational concept is its doubtful premise—that nonmilitary defense planning can be separated among agencies by time periods—the postattack survival period and the long-range rehabilitation period. Plans for wartime management of such limited resources as manpower and transportation cannot be realistically divided into two watertight compartments, one labeled “right after the attack” and the other labeled “later after the attack.” What is done in the management of resources to cope with immediate effects of attack influences what can or should be done in terms of rehabilitation and reconstruction of the national economy, and vice versa.

Whatever organizational entities are created following an attack to work toward reconstitution of the national economy will inevitably have to be built from some or all parts of existing Federal departments and agencies which will, of necessity, have been involved in coping with the survival aspects of attack. It will not be feasible to organize a new team of resource managers. The same team or at least many of the most important members will, of necessity, be involved in all phases of survival, recovery, and rehabilitation. The principle is probably even more applicable in the case of State and local governments; State and local officials will also have to be prepared to function through all phases after attack.

In short, our analyses to date raise substantial doubt as to whether the central responsibilities for nonmilitary defense of this Nation can continue to be divided between two agencies of the Federal Government.

(b) The executive department concept

This concept assumes that civil defense functions will be better carried out by an executive department. It involves proposals for either the transformation of FCDA into an executive department with its present functions or with additional functions, the merging of it with other agencies to form a new department, or the placing of it in an existing department.

Creation of a department would tend to encourage greater acceptance of the need for nonmilitary defense, thus increasing chances for developing an in-being postattack capability at State and local levels. It would provide a point of focus for direction and coordination of programs that are developed and undertaken to reduce vulnerability and increase the Nation's readiness to survive an attack. In addition, departmental status would tend to increase the prestige of the agency in the eyes of the public and among other Federal agencies; it would tend to raise morale in the agency; it would settle permanently the question of Cabinet status for the head of the agency which now must be considered to be settled only for the duration of the incumbent President's term. Departmental status might tend to make it easier to gain financial support, provided the department were able to develop and present sound nonmilitary defense programs and readiness measures.

On the other hand, departmental status would not eliminate the duplication, in sources of policy guidance and direction for other Government agencies, which now emanates from ODM and FCDA. Failure to eliminate such duplication would tend to reduce the chances of attaining an in-being postattack capability among Federal agencies at regional and national levels. It would also tend to be a continuing source of some confusion for the other agencies; a new executive department would face the same problems of gaining acceptance for and compliance with its delegations to other agencies as FCDA faces now, or it would be forced into uneconomical duplication of the activities of other departments and agencies.

Nonmilitary defense activities, as indicated in chapter 1, are of such nature that they involve many existing agencies of the executive branch. If the new department is given authority (as proposed in sec. 202 (10) of H. R. 2125, a bill introduced in the 85th Cong.) to continually review Federal programs for their civil defense aspects and make recommendations concerning administrative or legislative changes to conform such programs to civil defense requirements, the department would have control over the agencies nearly as great as that of the President and his staff. Older coequal departments cannot be expected to accept readily the direction and monitoring of their activities by a new department, or by an agency within an existing department. The problem of resolving disputes and securing interdepartmental cooperation would become acute.

Departmental status would also tend to freeze the organization structure, or at least to slow up the making of organizational changes because of need to submit them for legislative approval. This would tend to limit the President's

ability to modify organizational arrangements for nonmilitary defense activities quickly and easily to meet new conditions which are almost certain to arise from rapid changes in techniques of war, in enemy capabilities and intentions, and in technology of defense measures.

In summary, analyses of this alternative suggests that it is based on questionable assumptions. It assumes that one department can perform functions normally considered of a Presidential nature and can effectively guide, direct, and coordinate efforts of coequal departments and agencies on functions vital to the safety of the Nation and closely related to their normal peacetime activities. Our analyses to date raise serious doubts that this alternative would solve the organizational problems of the Federal Government's nonmilitary defense activities.

(c) *The Executive Office concept*

This concept assumes that the nature of modern warfare requires the involvement of most existing departments and agencies of the Federal Government as well as State and local governments. It assumes also that this widespread involvement creates a special need for centralized policy guidance, direction, and coordination of activities of the executive branch by or in the name of the President. The aim of its proponents is to locate policy guidance and coordination functions close to the President and to place the "operational" or "specialized" functions in agencies suitable for performing them.

1. *Cautions to be recognized.*—Adoption of this alternative would afford many advantages to be discussed below. But proper evaluation of this proposal requires consideration of two cautions.

First, it must be recognized that effective execution of the Federal Government's nonmilitary defense responsibilities may require the conduct of a wide range of "operating" or "specialized" functions (e. g., designing and operating warning systems, developing radiological defense measures, designing shelters, educating the public, and training State and local personnel in defense techniques). It was not anticipated that sufficient information would be available within this phase of this study to determine whether these functions should be assigned to a separate civil defense operating agency, whether they can all be allocated satisfactorily among existing departments and agencies, or, whether the remainder should be assigned to an operating agency or to an Executive Office agency. A final determination will be made in the second phase of this study.

Second, any plan which contemplates reorganizing agencies or redistributing responsibilities must be evaluated in terms of the effect of such change on the morale and productivity of the staffs of the agencies affected. The problem can be dealt with if the effects are foreseen and steps are taken to minimize them.

2. *Probable advantages.*—Placing responsibility for policy guidance and direction of planning for all nonmilitary defense activities in a single Executive Office agency would give greater assurance that plans for the entire nonmilitary defense job would be integrated and consistent. Creation of such an agency would make it simpler to direct and coordinate planning and to avoid development of different (and perhaps inconsistent) plans for various time phases or types of items, for various types of war, or by geographical areas.

An Executive Office agency would provide the framework from which increased emphasis on readiness measures could best be directed. It would also provide a single organization for thoroughly evaluating all readiness measures and for developing action programs to implement those that are adopted. Placing the agency at the Executive Office level would help to focus attention on the importance of the jobs to be done and thus help to create public awareness of them.

Under this alternative all policy guidance and direction would come from a single source; this would reduce confusion among Federal agencies engaged in planning and carrying out readiness measures. Delegations would also come from the President and this would firmly establish their importance. An Executive Office agency would provide a simpler framework than now exists for expediting formulation of policy and for settling questions that arise. This, in turn would expedite development of realistic plans and give greater assurance that Federal agencies will be prepared to perform effectively in an emergency. Vesting the responsibilities in the President and establishing the agency in his Executive Office would give him flexibility: he could change delegations and modify the organizational structure quickly whenever required to meet new needs caused by rapidly changing circumstances.

In summary, our study to date suggests that this alternative offers sound bases for overcoming the major shortcomings in the present organizational arrangements. It is more likely to meet the basic problems of organizing effectively for nonmilitary defense than the alternatives discussed previously.

GENERAL CONCLUSIONS DEVELOPED TO DATE

The analyses completed during this first phase of our assignment indicate that, if existing problems concerning organization for nonmilitary defense functions are to be solved, it will be essential to centralize responsibility for policy guidance and for direction and coordination of executive-branch activities related to them. This will require:

1. Vesting responsibilities and authorities for all nonmilitary defense functions in the President.
2. Establishing a central agency in the Executive Office of the President to aid him in formulating policies and in directing and coordinating plans and programs relating to these functions.

(a) *Vesting responsibilities in the President.*—The threat of nuclear war now confronting the Nation requires that steps be taken to plan and initiate actions that should be taken before an attack comes to reduce the Nation's vulnerability. The threat requires also that steps be taken to plan the emergency actions that will have to be taken in the event of attack to ensure survival and recovery from it. Such essential preattack and postattack nonmilitary defense actions, by their very nature, will necessarily affect all facets of the Nation's economy and involve all parts of the country. Logic dictates, therefore, that all levels of government—Federal, State, and local—participate in the planning and carrying out of necessary preattack steps and make preparations for executing coordinated postattack actions in the event they are ever needed. Logic dictates also that, for determining what actions are necessary and developing plans to carry them out, the Nation should rightfully draw on the knowledge, experience, and capabilities of the various departments and agencies of the Federal Government for leadership, guidance, direction, and coordination.

Preparing the Nation for facing the threat of nuclear war and for surviving and recovering from one, if it comes, is a responsibility of vital importance—one that is properly part of the job of the President. Direction and coordination of the Federal departments and agencies, particularly in matters that will affect the whole Nation and require widespread involvement of most elements of government, is also a responsibility of the President. It is essential and in keeping with his role, therefore, that the President be vested with responsibilities for the Federal Government's nonmilitary defense functions. Commensurate with these responsibilities it is essential that he also be given authority to delegate functions to existing departments and agencies and to establish such other organizational arrangements as he requires to discharge the responsibilities.

To vest these responsibilities and authorities in the President will require reexamination and modification of some existing legislation relating to nonmilitary defense activities. Some existing legislation vests major nonmilitary defense responsibilities in the President, some in the Administrator of FCDA.

Legislation relating to those functions now considered as defense mobilization, with which ODM is primarily concerned, is contained in Reorganization Plan 3 of 1953, in the National Security Act of 1947, as amended, and in the Defense Production Act of 1950, as amended. These acts leave no doubt that the President already has responsibility for all significant defense mobilization functions and also has flexibility to delegate them as circumstances warrant.¹⁹

On the other hand, legislation relating to those functions now considered as civil defense, with which FCDA is concerned, vests substantial responsibility and authority in the Administrator of FCDA. Under Public Law 920, the Federal Civil Defense Act of 1950, the Administrator may, for example, delegate civil defense responsibilities to other departments and agencies, subject to Presidential approval, and review and coordinate their activities (sec. 201 (b)). During a declared civil defense emergency, title III of the act gives him power to, among other things, direct the various agencies in relief activities for civil defense purposes and to control materials and services.

These powers, which are of great potential consequences, are not normally considered appropriate for assignment to an official subordinate to the President except by express delegation from the President.

The principle of vesting emergency functions in the President is well established. For example, Public Law 875, 81st Congress, authorizes use of Federal funds and personnel in cases of major disaster not caused by enemy action. Presumably such disasters would be much smaller than those contemplated

¹⁹ See Reorganization Plan of 1953 and Executive Orders 10461 of June 17, 1953, and 10480 of August 14, 1953.

under Public Law 920, the Federal Civil Defense Act of 1950. Yet, Public Law 875 vests responsibility in the President and gives him full authority to use any agency as necessary.

Similarly, the principle of vesting in the President responsibility for directing and coordinating complex programs involving several departments and agencies is also well established. For example, Public Law 665, the Mutual Security Act, vests responsibility in the President for the complex mutual defense assistance, development assistance, and related programs which involve several departments. Certainly these programs are no more vital nor would they require more Presidential direction and coordination than the civil defense programs contemplated under Public Law 920.

Thus, to vest all responsibilities for nonmilitary defense in the President, where they logically belong, and to give the President full authority for these matters, it will be necessary to modify Public Law 920, to make it consistent with other legislation relating to nonmilitary defense.

(b) *Establishing a central agency in the Executive Office.*—The vesting of responsibilities for the Federal Government's nonmilitary defense functions in the President is the first step in overcoming the existing organizational problems.

The second step is to ensure that the President has adequate assistance. This should be provided by establishing an agency in the Executive Office to formulate nonmilitary defense policies and to direct and coordinate, for the President, the Federal departments and agencies in carrying out nonmilitary defense functions delegated to them.

In addition to establishing an agency in the Executive Office, further actions are necessary to overcome the present organizational problems. The appropriate distribution of responsibility for the "operating" or "specialized" nonmilitary defense functions which are not deemed to be Presidential in nature must be determined. As indicated previously, insufficient information is available to make such determinations at this time. Further study must be undertaken to ascertain the exact nature of these functions and how they should be distributed. Four alternative organizational assignments of these functions warrant consideration:

1. To a separate nonmilitary defense operating agency.
2. To existing departments and agencies.
3. To an Executive Office agency.
4. To a combination of two or more of the above.

RECOMMENDED COURSE OF ACTION

To assure progress in improving the organization of nonmilitary defense activities, a course of action should be launched immediately that will inform Congress of the recognition of the organizational problem and of actions now underway and contemplated to correct it. We recommend that a statement be developed, for inclusion in an early Presidential message, that will indicate essentially the following:

1. The President recognizes that overlap and duplication limit the effectiveness of the present organizational arrangements for conducting nonmilitary defense functions (i. e., defense mobilization and civil defense functions).
2. He further recognizes that needs for nonmilitary defense have changed due to advances in military technology; the threat now confronting the Nation necessitates reconsideration of the assumptions underlying legislation and Executive orders which created the existing organizations for these functions.
3. He considers the nonmilitary defense functions to be of vital importance and he proposes to ask the Congress to vest in him certain responsibilities and authorities now vested by statute in other officials of the executive branch.
4. He believes it is essential to the safety of the Nation for the Federal Government to have an effective and dynamic organizational structure for nonmilitary defense. That structure must be so designed that all may find the necessary guidance and direction; it must assist in bringing together the coordinated might of the Federal, State, and local governments so that their capabilities are at all times ready to cope with emergencies that enemy action might create.
5. He has directed that studies of the existing organizational arrangements be made and that, when these are completed, he will suggest to the Congress such legislation as may be required.

APPENDIX 1

List of officials interviewed in connection with phase I of study

FEDERAL CIVIL DEFENSE ADMINISTRATION

Name	Position
Leo A. Hoegh.....	Administrator.
Lewis E. Berry, Jr.....	Deputy Administrator.
Raoul Archambault, Jr.....	Executive Assistant Administrator.
Wendell H. Duplantis.....	Assistant Administrator for Operations.
Eugene J. Quindlen.....	Deputy Assistant Administrator for Operations.
Alfred P. Miller.....	Director, Communications Office.
Robert Y. Phillips.....	Director, Continuity of Government Office.
Leslie L. Kullenberg.....	Director, Damage Assessment Office.
Ralph B. Thompson.....	Director, Federal Coordination Office.
Holmes E. Dager.....	Director, Natural Disaster Office.
Barent F. Landstreet.....	Director, Operations Plans Office.
James Buchanan.....	Director, Radiological Defense Office (acting).
Harry E. Roderick.....	Director, Warning Office.
Ralph E. Spear.....	Assistant Administrator for Planning.
Dean Pohlzen.....	Deputy Assistant Administrator for Planning.
Paul McGrath.....	Intelligence.
Gerald R. Gallagher.....	Assistant Administrator for Research and Development.
Arthur D. Morrell.....	Deputy Assistant Administrator for Research and Development.
M. M. VanSandt.....	Director, Biophysical and Medical Sciences Office.
Benjamin C. Taylor.....	Director, Engineering Development Office.
John F. Devaney.....	Director, Operations Research Office (acting).
John E. Welsh.....	General engineer, Physical Sciences Office.
Theodore M. Wilcox.....	Public welfare adviser, Social Sciences Office.
G. Lyle Belsley.....	Assistant Administrator for Resources and Requirements.
George Lucy.....	Deputy Assistant Administrator for Resources.
Lloyd Eno.....	Program Director for Resources and Requirements.
R. Smith.....	Assistant Administrator for Health.
Paul F. Wagner.....	Assistant Administrator for Education.
J. Brewster Terry.....	Director, Public Affairs Office.
Norman W. Abendschein.....	Director, Publications Office.
W. Gayles Starnes.....	Director, Training and Education Office.
William S. Heffelfinger.....	Assistant Administrator for General Administration.
Louis F. Kreiger.....	Director, Administrative Operations Office.
Joseph F. Napoll.....	Director, Contributions Office.
Joseph L. Miller, Jr.....	Director, Management Engineering Office.
Philip C. Baldwin.....	General Counsel.
Edward B. Lyman.....	Assistant Administrator for Special Activities.
W. B. Pettigrew.....	Director, Foreign Representation Office.
Virgil L. Couch.....	Director, Industry Office.
William P. Welsh.....	Labor Participation Office.
Fred W. Kern.....	Director, Religious Affairs Office.
Jean Wood Fuller.....	Director, Women's Activities Office.
Philip D. Batson.....	Region 7 Administrator.
Paul Lindquist.....	On Reimbursable Detail with Public Health.

OFFICE OF DEFENSE MOBILIZATION

Gordon Gray.....	Director.
John Hilliard.....	Assistant Director for Manpower.
C. A. Sullivan.....	Assistant Director for Plans and Readiness.
Merrill J. Collett.....	Planning Officer.
Russell Hughes.....	Assistant Director for Production.
William N. Lawrence.....	Industrial Specialist.
Sherman S. Sheppard.....	Material Specialist.
Ed Phelps.....	Assistant Director for Stabilization.
Leonard A. Skubal.....	Stabilization specialist.
Jerry Matejka.....	Assistant Director for Telecommunications.
George A. Landry.....	Assistant Director for Transportation.
Charles E. Offutt.....	Executive Assistant, Transportation.
Robert West.....	Special Assistant to Director on Progress Evaluation.
Palmer Dearing.....	Assistant Director for Health.
Joseph E. Brown.....	Special Assistant.
James King.....	Assistant Director for Coordination.
Henry F. Hurley.....	Chief, Continuity of Government Division.
Robert L. Finley.....	Assistant Director for National Security Affairs.
Vincent P. Rock.....	Deputy Assistant to Director on N. S. C. Affairs.
Jarold A. Kieffer.....	National Security Council Planning Board Assistant.

List of officials interviewed in connection with phase I of study—Continued

DELEGATE AGENCIES AND DEPARTMENTS

Name and position	Agency or department
Paul R. Andrews, civil defense officer.....	Post Office Department.
M. Carter McFarland, Assistant Administrator for Plans and Programs.....	Housing and Home Finance Agency.
William J. Herman, Director, Defense Planning Branch.....	Do.
L. B. Taylor, Director, Food and Materials Requirements Division.....	Department of Agriculture.
Theodore Gold, assistant to the Under Secretary.....	Do.
Alen Brockway, regional director, Bureau of Employment Security.....	Department of Labor.
John J. Judge, field office manager, Office of Field Services.....	Department of Commerce.
W. L. Mitchell, Deputy Commissioner, Social Security Administration.....	Department of Health, Education, and Welfare.
Carl D. Monroe, executive assistant regional director.....	Do.
Rufus E. Miles, Jr., Director of Administration.....	Do.
Richard L. Seggel, Director, Office of Management Policy.....	Do.
Dean Snyder, Defense Coordinator.....	Do.

BUREAU OF THE BUDGET

Name	Position
William F. Finan.....	Assistant Director, Management and Organization.
Hirst Sutton.....	Assistant Chief, Office of Management and Organization.
R. Scott Moore.....	General Management and Organization Staff.
Herbert N. Jasper.....	Do.
William Bowman.....	Budget examiner.
William Kolberg.....	Do.

PART II—ORGANIZATION FOR NONMILITARY DEFENSE
PREPAREDNESSWASHINGTON, D. C., *March 21, 1958.*

HON. MAURICE H. STANS,

*Director, Bureau of the Budget,
Washington, D. C.*

DEAR MR. STANS: We submit herewith three memorandums presenting the findings and recommendations resulting from phase II of the study we undertook in accordance with your letter of November 27, 1957. These three memorandums follow and augment the first memorandum in this series which was submitted in the form of a report on phase I of the study on December 31, 1957.

In this second phase of the study we—

1. Analyzed in detail the nature of the nonmilitary defense preparedness functions to be performed.
2. Considered alternatives as to how they should be distributed within the Federal Government.
3. Analyzed alternative arrangements for providing leadership, direction, and coordination for these functions.
4. Ascertained what organizational arrangements were necessary in the field to stimulate and assist State and local governments in their nonmilitary defense preparedness activities and to coordinate their efforts with those of the Federal Government.

The enclosed memorandums present the findings and recommendations resulting from this study. The recommendations are summarized in the following paragraphs.

1. The memorandum entitled "The Need for Clarifying and Expanding the Role of Departments and Agencies in Nonmilitary Defense Preparedness" recommends greater utilization of established departments and agencies and clarification of existing assignments.
2. The memorandum entitled "Improved Organization for Executive Leadership of Nonmilitary Defense Preparedness" recommends abolition of ODM and FCDA and establishment of a new agency in the Executive Office of the President. This agency would be responsible, in behalf of the President, for providing essential leadership, direction, and coordination for all assigned nonmilitary

defense preparedness functions of the established departments and agencies and for performing those functions which cannot now be assigned.

3. The memorandum entitled "Tasks and Organization in the Field in Building Nonmilitary Defense Preparedness" recommends replacing ODM and FCDA's present field structures with eight regional offices. These regional offices would be headed by regional deputy directors of the Executive Office agency recommended in the third memorandum. They would be responsible for stimulating and assisting State and local nonmilitary defense efforts and for coordinating Federal, State, and local nonmilitary defense preparedness efforts in the field.

In a subsequent and final memorandum we will suggest how the Office of Civilian Mobilization that we propose be established and organized within the Executive Office of the President.

We have appreciated this opportunity to serve you and stand ready to discuss with your staff questions that may arise in implementing the recommendations set forth in the accompanying memorandums.

Respectfully submitted.

MCKINSEY & Co., INC.

**ORGANIZATION FOR NONMILITARY DEFENSE PREPAREDNESS—BUREAU
OF THE BUDGET**

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*The first memorandum was submitted on December 31, 1957, in the form of a report entitled "A Framework for Improving Nonmilitary Defense Organization."

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2. THE NEED FOR CLARIFYING AND EXPANDING THE ROLE OF DEPARTMENTS AND AGENCIES IN NONMILITARY DEFENSE PREPAREDNESS

INTRODUCTION

This is the second of a series of memorandums presenting the results of our study of existing organizational arrangements for the conduct of the Federal Government's defense mobilization and civil defense functions. The first memorandum was submitted on December 31, 1957, in the form of a report entitled "A Framework for Improving Nonmilitary Defense Organization."

That first memorandum identified the problems resulting from the present organizational arrangements, set forth principles that should guide the improvement of organizational arrangements, and analyzed several alternative forms of organization. It recommended vesting responsibilities and authorities for all nonmilitary defense functions in the President and providing him with necessary staff assistance to aid in discharging those responsibilities. The President's budget message for fiscal year 1959, submitted subsequently, included a reference to the problems noted in this first memorandum and expressed the President's conviction that nonmilitary defense functions should be vested in him.

This memorandum discusses the substance of nonmilitary defense; i. e., it pictures those activities that together constitute the job of preparing the Nation's nonmilitary defenses. It recommends that the roles existing Federal departments and agencies play in carrying out these activities be clarified and expanded.

The need for clarifying and expanding the roles of these departments and agencies stems primarily from the threat now facing the nation. During past wars, time was always available after outbreak of hostilities to build up and expand the governmental agencies necessary for mobilizing and controlling the utilization of essential manpower, materials, and facilities and for controlling economic factors such as wages, prices, and rents.

Now, however, the capability of a potential enemy to launch a massive nuclear attack on this continent adds new and urgent dimensions to the nonmilitary aspects of waging war. Preparation must now be made in advance to mobilize this country's resources against a war launched with practically no warning, in which megaton bombs of unprecedented devastation may be expected, and when radiation fallout will blanket large areas. Time will not be available to develop new organizations to utilize available resources immediately following the attack. As pointed out in our first memorandum, existing Federal, State, and local governmental machinery, will, of necessity, constitute the basic structure to assemble, control, manage available resources and provide the essential services required for survival and rehabilitation. If these government organizations are to be prepared their responsibilities must be clear and their plans must be well developed and rehearsed.

SUBSTANCE OF NONMILITARY DEFENSE

What must be done—in advance and after an attack—to protect this country, its people, and its resources and to utilize those resources for retaliation, survival, and rehabilitation? For purposes of analysis, the identifiable functions that make up the nonmilitary defense job are classified in 16 program areas.²⁰ They are bulk of the functions for which adequate organizational arrangements must exist. Summary statements of these program areas are set forth below in four groups:

1. Program areas that affect the survival of civilians and the satisfaction of their needs in an emergency.

(a) *Shelter*.—Determine what types of protective shelter are feasible and needed in relation to other possible means of protection (e. g., evacuation), develop and execute whatever programs may be approved for constructing and maintaining shelters, and educate the public on the need for and utilization of such shelters as are agreed upon.

(b) *Radiological defense*.—Determine nature of radiation hazard and protection needed, and assign responsibilities to develop capability for monitoring, reporting, and analyzing fallout, providing suitable countermeasures, treating casualties, and educating the public as to the threat and radiological safety techniques.

(c) *Food*.—Determine the postattack food needs, conduct programs for the management and building up, if necessary, of food supplies needed for survival; develop plans to control during an emergency the production, processing, and distribution of food.

(d) *Health and medical*.—Conduct preattack programs to increase mobilization capabilities (e. g., training of health personnel in special wartime treatment techniques, stockpiling of medical supplies, etc.), and develop wartime plans for the care of casualties, and the protection of the health of the uninjured, including the organization, use, and control of health personnel, supplies, equipment, and facilities.

(e) *Emergency housing and community facilities*.—Determine need for emergency housing in the event of an attack; determine vulnerability of water and sewage systems and other essential community facilities. Develop preattack programs for reducing vulnerability (e. g., stockpiling supplies and equipment, reducing urban congestion, hardening exposed essential facilities). Develop plans for emergency wartime operating procedures (e. g., procedures for billeting and emergency treatment of contaminated water), and for community restoration and rehabilitation (e. g., clearing debris, restoring essential facilities).

(f) *Welfare*.—Determine postattack welfare needs; develop plans for providing food (i. e., mass feeding techniques), clothing, lodging (i. e., billeting procedures), bedding, medical supplies, and other necessities for existence to the needy, injured, and unemployed; develop plans for the provision of cash assistance in relation to plans for economic controls; develop child-care programs; and programs for the relocation of displaced population from temporary facilities to permanent locations.

2. Program areas that affect the management, in an emergency, of the Nation's economic systems, material, and manpower resources.

²⁰ These 16 program areas cover the bulk of the functions that make up the total nonmilitary defense job. Some functions (e. g., protection against unconventional warfare, fire protection, police protection) were necessarily omitted in the interest of brevity. Their omission does not imply lack of importance, rather that they are still evolving or that their assignment is already clearly established.

(a) *Emergency economic planning activities.*—Planning for basic income flow, price-wage-rent controls, rationing, credit extensions and guaranties, insurance and other financial operations, and adaptation of fiscal policies to emergency conditions.

(b) *Material resources and production.*—Determine material resources and productive capacity needed; develop and carry out preattack programs to encourage building up the Nation's capacity to produce essential survival and rehabilitation items and reducing vulnerability of production and supporting service facilities (principally fuel, power, transport, and communications facilities); prepare plans to control material resources and production in the event of attack.

(c) *Manpower.*—Determine essential manpower requirements and make preparations for meeting these needs; these preparations include development and administration of programs for recruiting, training, and utilizing civilian manpower, including scientific and technical, health, maritime, and other specialists and for alleviating existing or potential shortages by liberalizing employment standards, stimulating use of foreign labor, and undertaking such other programs as the national defense executive reserve.

3. Program areas designed to provide essential services.

(a) *Warning and communications.*—Arrange for building, installing, maintaining, operating, and improving systems for disseminating warning and for providing communications to support and direct postattack operations. Obtain "common user" communications services for departments and agencies not having substantial volumes; carry out, in behalf of the President, responsibilities vested in him by the Federal Communications Act of 1934, including the assignment of radio frequencies to Federal users, and development of emergency plans for directing carriers to give preference or priority to certain communications and controlling the operations of certain communications facilities.

(b) *Transportation.*—Determine emergency requirements; develop and carry out preattack programs in collaboration with railroad, truck, bus, airlines, and water transport industries to provide for essential wartime and disaster transportation services. Prepare plans and standby orders for the provision, utilization, and operation of essential transportation systems during an emergency.

4. Program areas that support the nonmilitary defense program as a whole.

(a) *Research.*—Conceive, conduct, or sponsor, and evaluate research designed to aid in determining the nature of hazards (e. g., radiation), the protection that might be afforded (e. g., shelter, warning, measures to counter radiation hazards), and other postattack measures required (e. g., casualty care, damage assessment, economic controls, restoration techniques).

(b) *Public information and education.*—Determine needs for and develop programs and materials to inform and educate the public as to the probabilities of attack, the nature of it, the facilities available for protection, and the actions to be taken in the event of attack. Work with and provide materials to public and private organizations to enlist their aid in informing and educating the public.

(c) *Training.*—Provide leadership training for State and local officials and civil defense directors; provide training in specific skills for personnel at State, local, and Federal levels who need to develop the skills to perform their assigned nonmilitary defense functions. Prepare training materials; develop and carry out training programs and courses; encourage educational institutions to include nonmilitary defense training in their curriculums.

(d) *Damage assessment.*—Assemble and record data as to location and quantities of resources and facilities that will be essential for postattack activity; develop methods for ascertaining and reporting extent of damage to them in the event of attack; develop and test methods for rapidly analyzing recorded and reported data to determine demands for and availability of resources and facilities that survive attack.

(e) *Government organization for operating in an emergency.*—Developing plans for continued operation of existing Federal, State, and local agencies and for establishment, organization, staffing, and operation of needed temporary agencies during an emergency; carry out preattack programs to provide protected facilities from which these agencies can operate in an emergency.

CHARACTERISTICS OF NONMILITARY DEFENSE PREPAREDNESS

The functions summarily listed in the foregoing program areas, when viewed as activities of government, have five distinguishing characteristics:

1. *Many activities are unprecedented.*—Modern weapons and the apparent capabilities of aggressor nations to deliver them on this continent makes possible a massive nuclear attack on the United States of unprecedented character.

A full-scale program for preparing the nonmilitary defenses of the Nation for an attack would require telling people in very specific terms of the probable consequences and convincing them of the need for accepting behavior patterns dissimilar to anything to which they are accustomed. They would need to be conditioned to react in a predetermined manner to the conditions of attack. The apathy of the public today toward nonmilitary defense, despite widespread knowledge of the threat, shows how drastic must be the measures if the President and Congress decide that full readiness should be sought.

2. *These activities must be interrelated in action.*—Attacks on this continent that could be visualized as late as 1952 were local in nature and relatively small in consequences. In 1958, we are able to visualize simultaneous attacks on all military targets and major urban centers that could cause the devastation of whole areas and tens of millions of casualties.

The protection of people against such comprehensive devastation would require not only shelters or emergency housing, but food, water, medical, and sanitary supplies as well as the manpower and service facilities to utilize and control them effectively. All these activities must be coordinated to insure that they contribute to survival. Similarly, to mobilize resources for limited war requires the effective coordination of those activities carried on to allocate materials, mobilize manpower, allocate services and control wages, prices, and rents.

3. *Responsibility for these activities is diffused horizontally and vertically.*—Nonmilitary defense is distinctive in the degree to which achievement of its objective, in the event of an attack, requires continuing collaboration of government agencies from the President to the local policemen and firemen. All levels of government—local, State, regional, and National—and most departments and agencies at each level must be prepared in an emergency to function with a degree of coordination not required in carrying out any other governmental function; or if cut off from the rest of the Nation, to function independently according to predetermined plan.

4. *Most activities are, in essence, planning and preparing for a future (and hopefully avoidable) eventuality.*—Agencies of government entrusted with responsibility for nonmilitary defense preparedness activities are simultaneously responsible for essential current operating functions. Those preparedness activities are postponable and are likely to claim secondary attention. Moreover, funds for their support have been less readily forthcoming from the Congress.

5. *These activities require continuing executive leadership.*—The diffusion of responsibility for these activities, their "future" character, and their essentiality to the survival of the Nation if it is attacked, make continuing executive leadership necessary. For example, planning and organizing for the warning of an attack require preattack planning by Federal agencies and State and local governments as well as the development of an understanding by the public of the warning be expected and the action individuals should take. Simultaneously there is necessity for a continuing evaluation of the readiness of existing plans at Federal and State and local levels in the light of the threat and enemy capabilities.

CRITERIA FOR ASSIGNING RESPONSIBILITIES

The unpredictability and the drastically short warning time of a possible attack make essential the utilization of existing Federal, State, and local governmental machinery to carry on most nonmilitary defense preparedness activities.²¹ Many Federal departments and agencies are already administering peacetime activities that are similar to those that would be required for nonmilitary defense. Hence, it is logical to extend their responsibilities to include performance of functions involving plans and preparations for the conduct of the essential emergency activities with which they are familiar. It is neither feasible nor economical to assign duplicating and inextricably related responsibilities to a separate Federal agency.

²¹ See preceding discussions on pp. 323 and 433.

The immediate problem, hence, is to identify the potential capabilities of departments and agencies that should be utilized and determine which functions should be assigned to them. An additional problem—that of determining how the nonmilitary defense preparedness activities assigned to the departments and agencies can best be directed and coordinated to insure effective overall nonmilitary defense for the Nation—will be considered in the third memorandum of this series.

To establish bases for determining the appropriate distribution of nonmilitary defense functions to established departments and agencies, five criteria were developed. They are:

1. *Clarity of definition of the function.*—Has the function developed to the point where it can be defined clearly enough to enable the department or agency to which it is to be assigned to proceed effectively?
2. *Availability of needed facilities.*—Does the department or agency have, or can it add to its staff the requisite administrative, research, and program skills? Does it have or can it add necessary facilities to carry out this function?
3. *Relation to continuing functions.*—Is the department or agency already carrying out peacetime functions of a related nature or is it being assigned related nonmilitary defense functions?
4. *Relation to States and localities.*—Does the department or agency have established interrelationships with State and local governments, and means of communication with industries and private groups, and with other Federal agencies that will have a related role?
5. *Capability for effective performance.*—Can the department or agency be relied upon to focus requisite attention on the function? Will conduct of the activity be limited by conflict with the department's peacetime functions? Would the department or agency be able to conduct the activity without excessive coordination of or dependence on other departments?

ANALYSIS OF PROGRAM AREAS

Analysis of the 16 nonmilitary defense program areas in the light of these criteria indicates that:

1. In six program areas no significant change in the present assignment of functions to established departments and agencies is required (emergency housing and community facilities, emergency economic planning, material resources and production, transportation, damage assessment, and government organizations for emergency).
2. In eight program areas there is need for assigning additional functions or clarifying existing assignments to departments and agencies (radiological defense, food, health and medical, manpower, communications, research, training²² (skills), and welfare).
3. In three program areas there is need for retaining responsibility for the functions in a single central organization and clarifying them (shelter, public information and education, and training²² (leadership)).

In reaching these conclusions we addressed ourselves primarily to the propriety of organizational assignments for functions presently known and not to the adequacy with which they are being conducted. Also, we limited our recommendations, for the most part, to the assignments considered appropriate for departments and agencies other than the Department of Defense. It should be recognized, however, that effective coordination between military and non-military defense activities will be essential at all times; and, wherever appropriate, specific supporting assignments to the military departments should be made.

(a) Program areas requiring no significant change

Our analyses reveal no need for change at present in existing assignments of nonmilitary defense preparedness functions to departments and agencies for the seven program areas discussed in succeeding paragraphs.

1. *Emergency housing and community facilities.*—In this program area, Federal Civil Defense Administration develops material to acquaint State and local civil defense officials with the effects on their communities of nuclear attack. It advises them as to the provisions they will have to make for the citizens of their communities after attack. It also has assigned responsibilities in this area

²² Note that training is included in both 2 and 3. This program consists of two major divisions, skills training and leadership training. The entire program will be discussed subsequently under the third category although the recommended handling of each of the two divisions differs.

to Housing and Home Finance Agency and Health, Education, and Welfare for functions concerning the provision and protection of housing and community facilities and Health, Education, and Welfare for functions concerning protection of sewage and water facilities and supplies.

Both agencies, by virtue of the skills and knowledge they have acquired to carry out related peacetime activities, have the potential capacity to carry out the emergency housing and community facilities functions assigned to them. It will be logical, therefore, to continue these assignments to Housing and Home Finance Agency and Health, Education, and Welfare with direction and coordination from a central agency.

2. *Emergency economic planning.*—At present, Office of Defense Mobilization provides central direction and coordination to departments and agencies involved in this program. Functions relating to maintenance of the monetary system or design of emergency monetary measures are now assigned to the Federal Reserve System and Housing and Home Finance Agency (housing credit), wage and salary controls to the Department of Labor, and rent controls to Housing and Home Finance Agency.

These assignments are logical and in keeping with the normal functions of these agencies. They have the requisite skills and knowledge, and they should continue to perform the assigned functions under central direction and coordination.

3. *Material resources and production.*—ODM is now responsible for this program area. It draws heavily on various departments and agencies to assist in conducting feasibility or supply-requirements studies for essential military and nonmilitary items (e. g., Departments of Commerce, Interior, Agriculture, Defense, Health, Education, and Welfare, Atomic Energy Commission, Federal Power Commission, Interstate Commerce Commission). It also assigns responsibility to other agencies to carry out activities that have been designed to help increase the Nation's capacity to produce essential goods and services and to increase its readiness.

For example, the Department of Commerce, Interior, and Defense review and make recommendations on tax amortization applications from industries with which they are concerned. These same departments, and the Department of Agriculture, contact industries with which they are familiar to encourage them and offer them advice and assistance in reducing their vulnerability to attack. Functions relating to stockpiling preattack of strategic and critical materials are assigned to the General Services Administration.

These arrangements are soundly conceived. The departments and agencies should continue to perform the assigned functions under central direction and control.

4. *Transportation.*—At present ODM is responsible for developing plans and making preparations to provide essential transportation services in an emergency. In discharging this responsibility it utilizes other agencies—primarily, the Departments of Commerce and Defense, and the Interstate Commerce Commission—to help estimate requirements, identify potential bottlenecks, prepare plans for eliminating or overcoming them, and make preparations to organize and control the transport industries. FCDA is working with States to help them develop plans for meeting their transportation requirements.

These assignments are logical, but at present no arrangements exist for effectively integrating State and Federal planning. The Departments of Commerce and Defense and the Interstate Commerce Commission should continue to carry out their assignments under central direction and coordination. Steps should be taken at an early date to clarify responsibilities for contacting State officials on transportation matters to insure that State plans are consistent with Federal policies and plans.

5. *Damage assessment.*—Functions relating to damage assessment were originally undertaken by FCDA. Now, however, they are carried out under the direction of ODM at the National Damage Assessment Center. The Center is staffed by representatives from FCDA, Department of Defense, and other agencies with skills and knowledge about essential resources and with ability to assemble and analyze resource data.

The damage assessment program, to be effective, requires central direction and coordination. It requires also the participation of personnel of agencies with knowledge of and access to data about the Nation's resources. Thus, the present assignments in this program area should be continued.

6. *Government organization for emergency.*—The functions relating to this program area are now assigned to ODM and FCDA—ODM for Federal organiza-

tions and FCDA for State and local. Other Federal agencies, which have an assigned role in an emergency, participate with ODM in developing emergency organization and operating plans and in establishing relocation sites. FCDA guides State and local governments in similar activities.

At present, there is overlap on regional organizations and confusion over how to tie State and local plans and activities and those of the Federal Government into an effectively integrated whole. Overcoming these problems and carrying out the program effectively require centralization of responsibility in a single directing and coordinating agency and continuing participation of agencies that will have an essential role in the emergency. Plans must be drawn so that responsibilities for all functions are distributed and that an organizational entity exists to carry out each function.

(b) Program areas requiring clarification and additional assignments to departments and agencies

Our analyses indicate a need for clarifying or assigning additional functions to departments and agencies in the seven program areas discussed in succeeding paragraphs.

1. *Radiological defense.*—The hazard of radiation fallout creates the need for unique governmental activities. Local and State governmental units must be equipped to determine the actual areas and concentrations of radioactivity. Capability must also be developed on a national scale to back up local and State monitoring capabilities. Such a national network should be able to determine actual areas and concentrations of radioactivity and, by utilizing meteorological data, predict where radiological contamination will result.

Capability must be developed to analyze and communicate these data, and the public must be informed how to protect themselves. Research must continue on all factors relating to radiological defense—nature of the hazard, exposure criteria or allowance, monitoring, analysis and prediction techniques, countermeasures, and treatment—to improve our defenses.

At present FCDA is responsible for drawing on or coordinating numerous activities of several departments and agencies to develop a nonmilitary radiological defense program. FCDA, with the Weather Bureau and Civil Aeronautics Administration, is establishing a network of fixed monitoring stations. Adequate provisions have not yet been made for aerial monitoring, nor integrating and providing appropriate communications for operation of the entire net. FCDA also is attempting to assist State and local agencies develop radiological defense capability by supplying training instruments, conducting training courses, and offering educational material and advice to guide the development of planning activities.

Research is being conducted by many agencies (e. g., Bureau of Standards, Atomic Energy Commission, Department of Defense, Public Health Service, Weather Bureau). The Public Health Service has developed a monitoring network in conjunction with the Atomic Energy Commission and the Department of Defense to support nuclear test activities. The Public Health Service has recently launched a program to encourage State and local health departments to develop capability of coping with peacetime radiation hazards (e. g., X-rays, power reactors). However, these activities have not yet been integrated into the Nation's nonmilitary defense plans and programs.

Much more needs to be known before concepts as to what constitutes adequate radiological defense can be precisely determined. The skills, knowledge, and facilities of many departments and agencies must be utilized to carry out the total program. Therefore, at its present State of development, overall responsibility for the program should continue to rest with a central directing and coordinating authority.

However, the activities related to radiological defense now being performed by established departments but not yet identified as part of nonmilitary defense should be clarified and additional assignments made as appropriate. More specifically:

(a) When a determination is made as to the number of additional fixed monitoring stations required, Government facilities where the potential capability exists should be selected and added to the monitoring net. The present net of the Public Health Service which now operates in support of the Atomic Energy Commission and the Department of Defense nuclear test activities might well be utilized as a basis for expansion required.

(b) Similarly, when the requirements for aerial monitoring are precisely determined, the function should be assigned to the organization with the capability. At present, the most logical candidates appear to be the Air Force or the Civil Air Patrol.

(c) When a determination is made as to appropriate methods for organizing and for developing capabilities at State and local levels and for informing the public, the existing capabilities and established channels of the Public Health Service to State and local levels should be utilized. Informing the public of wartime radiation hazards and protective measures is a logical extension of the Public Health Service role of informing the public of peacetime radiation hazards and preventive measures.

2. *Food.*—The Department of Agriculture now has delegations from FCDA and ODM to develop a national food program and plan an emergency food agency. These delegations are in broad and general terms; no firm understanding has been reached among the agencies involved as to the precise role or specific functions the Department of Agriculture should perform.

The Department of Agriculture is now an integrated food agency; it now conducts activities relating to and has the skills, knowledge, and established channels for carrying out functions concerning food production, processing, and distribution.

Its present delegations should be clarified and made specific. It should be assigned the functions of developing plans for control in an emergency of food production and processing and of working with the agencies responsible for economic planning and transportation to develop plans for effective food distribution. It should keep food officials at State levels informed of Federal plans and aid them in developing their food plans in consonance with the Federal food plans and with mass feeding plans developed by welfare officials. It should also conduct preattack programs considered to be essential to maintain readiness (e. g., food stockpiling) and to reduce vulnerability (e. g., dispersal of stockpiles and food processing facilities) under central direction and coordination.

3. *Health and medical.*—The Department of Health, Education, and Welfare (U. S. Public Health Service) has been delegated responsibility for major health and medical functions such as the preparation of operating plans for the emergency restoration and rehabilitation of health facilities. It has a staff with the required skills, and established interrelationships with State and local health agencies; it has what experience there is on a controlled distribution of medical supplies; and it has established contacts with the medical profession and related outside groups.

The following additional tasks are a logical extension of the present functions of the Department of Health, Education, and Welfare (U. S. Public Health Service) and should be assigned:

(a) Determination of types of items for medical stockpiling, the quantities, scheduling, and location.

(b) Review and approval of State plans involving matching funds allocated by the central nonmilitary defense agency for procurement of medical supplies, equipment, and facilities.²³

(c) Development of guidelines and plans for the treatment and care of casualties in an emergency; work with State health agencies and non-governmental medical organizations to aid them in developing capability to handle casualties.

(d) Procurement of equipment for emergency treatment stations and hospitals and determination of their location.

4. *Manpower.*—Responsibilities for making plans and preparation to recruit, train, assign, and utilize essential manpower for an emergency are currently distributed among several agencies—the Departments of Labor and Defense, the Selective Service System, the Civil Service Commission, the National Science Foundation, the Railroad Retirement Board, and the Maritime Administration.

²³ This recommendation is illustrative of a basic principle. If capabilities for nonmilitary defense are to be developed in an existing department or agency it will be essential to utilize its potential capacities to the fullest possible extent. Its capability for handling a nonmilitary defense function will be developed more effectively if it can simultaneously utilize its capacity for administering grant-in-aid funds. Appropriations for grants to the States would, we contemplate, be made to the central nonmilitary defense agency. Annual allocations would be made by that central agency on the basis of approved budgets to the departments and agencies which have been assigned the nonmilitary defense function and have the capacity to handle grant-in-aid funds related to the function. The delegate agency would then administer the grants in accordance with approved standards and procedures.

Responsibility for dealing with specialized medical manpower problems—one of the most essential skills in an emergency—has not yet been clearly established.

Current delegations of ODM and FCDA to the Department of Labor should be consolidated and clarified. Responsibilities of the Department of Defense, the Selective Service System, the Civil Service Commission, the National Science Foundation, the Railroad Retirement Board, and the Maritime Administration should be continued. In addition, Health, Education, and Welfare, which has the necessary skills, knowledge, and contacts, should be assigned responsibility for handling the nonmilitary defense medical personnel problems. This would include:

- (a) Estimating requirements for doctors, nurses, and technicians.
- (b) Inventorying and cataloging skills.
- (c) Preparing plans for the utilization of these skills available for non-military defense in an emergency.
- (d) Conducting programs to augment these skills where necessary.
- (e) Providing training needed to acquaint medical personnel with emergency conditions and techniques.

5. *Warning and communications.*—Responsibility for developing and operating the warning system now rests with FCDA. Responsibility for planning the establishment and operation of communications facilities in an emergency is now widely distributed throughout the Federal Government under direction and coordination of ODM. Many agencies (e. g., Department of Defense, General Services Administration, Civil Aeronautics Administration, Department of State, Federal Communications Commission, FCDA) have a peacetime capability for providing or obtaining communications services and for operating and controlling communications facilities that can be utilized in an emergency.

To insure that consistent provisions are made to furnish essential communications services and to control communications facilities in an emergency, responsibility for directing and coordinating all communications planning activities for an emergency should be retained under a central authority. That authority should, however, draw on the existing communications capabilities of established departments and agencies, particularly General Services Administration, Federal Communications Commission, and Department of Defense, to aid in carrying out the program.

Within the warning and communications program area, two separate types of functions now performed by FCDA can be assigned to other agencies:

(a) General Services Administration should be assigned the functions relating to the acquisition or provision of facilities for nonmilitary defense communications required in an emergency. This is a logical extension of its present role of providing central services.

(b) The Department of Defense (Air Force) should be assigned functions relating to the warning system. The civil defense warning system is already linked to the Air Force operated continental defense warning net; FCDA has men stationed at the headquarters of the North American Air Defense Command and its three geographical divisions to take information from Air Force personnel, determine what areas should be alerted, and pass on the warning to appropriate civil defense key points. It would be a logical extension of the Air Force's present job of alerting military key points to assign it responsibility for also alerting the civil defense key points. The Air Force also has the facilities, skills, and knowledge for establishing standards and specifications for equipping warning centers and for prescribing procedures for operating them. Direct contact with the States on equipping and operating warning centers need not be assigned the Air Force. The field offices of the central nonmilitary defense authority, using the standards and specifications developed and prescribed by the Air Force, should handle the necessary contacts, approve contributions, and inspect for compliance.

6. *Research.*—Continuing research is essential, if maximum protection is to be provided for hazards which are little known and steadily evolving, and if considered nonmilitary defense policies and programs are to be established and revised.

At present, research that has potential application to nonmilitary defense is being conducted by many departments and agencies. Results of these research activities are translated into nonmilitary defense applications by the department conducting the work under direction and coordination of FCDA or by FCDA.

Responsibility for conceiving, conducting or supporting, and assessing research activities related to a particular activity (e. g., methods for preservation and handling of food to be stockpiled) should be assigned to the department or agency which is responsible for the function which the research supports.

Following this principle, responsibilities for research should be assigned as follows:

(a) Research that supports functions maintained in the central directing and coordinating agency should be assigned to that agency. This would include responsibility for determining the need for, supporting, and assimilating the results of research on (1) shelters, (2) the nonmilitary defense aspects of radiological defense, (3) damage assessment, and (4) economic controls. Universities, private research institutions, and other Government agencies such as Health, Education, and Welfare and the Atomic Energy Commission with qualified staffs and suitable facilities should be utilized to conduct the actual research and assist the central directing and coordinating agency in its interpretation and application.

(b) Health and medical research should be assigned to Health, Education, and Welfare (U. S. Public Health Service). The Public Health Service should be made responsible for those research projects that support or are a logical extension of its responsibilities relating to planning and improving readiness for handling post-attack casualty care and health problems (e. g., research on blood plasma, biological effects of attack, immunization, development of complete food for emergency medical feeding, and shelter habitability problems).

(c) Responsibilities for conceiving, conducting or supporting, and assessing research activities related to protection, production, processing, storage, and handling of essential food items should be assigned to the Department of Agriculture. Essentially, the Department's peacetime research responsibilities are closely related to these functions. Some adjustments in certain projects may be appropriate to insure highlighting of potential nonmilitary defense applications.

(d) Responsibilities for determining requirements for and supporting research on essential emergency communications facilities and methods should be assumed by General Services Administration and on warning devices and systems by the Air Force. These assignments would follow previously recommended assignments to those agencies for communications and warning functions.

7. *Training (skills).*—For discussion of this subject, please refer to the paragraphs on training in the next section of this memorandum.

8. *Welfare.*—FCDA has delegated to the Department of Health, Education, and Welfare (Social Security Administration) responsibilities for only two segments in the welfare program area; i. e., provisions of financial assistance and clothing. These two assignments cover a small part of the total welfare program area which encompasses the provision of all those welfare services necessary to sustain individuals and their families in the immediate postattack period. A broader delegation is needed to adequately perform all the functions in this area. The current delegation to Health, Education, and Welfare should be expanded to include the provision of temporary housing, food, bedding, medical supplies, and necessary household equipment; special child-care programs; the relocation of displaced population from temporary facilities to permanent locations; and various psychiatric and social services. Some of these functions have been delegated or are being considered for delegation to other departments and agencies (e. g., billeting procedures to Housing and Home Finance Agency; registration and information services to the Post Office Department) which has weakened the development of an effective and coordinated welfare program. Health, Education, and Welfare has in its welfare organization the requisite knowledge and experience and an organization in existence which can be utilized.

In the carrying out of this delegation Health, Education, and Welfare should call upon the various resource agencies for logistical support (e. g., Agriculture, food; Housing and Home Finance Agency, housing; Commerce, clothing). Plans for welfare services must be coordinated not only with one another, but also with the resource planning of the above-listed agencies and the basic emergency economic and monetary measures. Therefore, the welfare assignments to Health, Education, and Welfare should be carried out under central direction and coordination from the central Executive Office agency.

(c) Program areas to be retained under central authority

Our analyses indicate need for retaining primary responsibility for functions in three program areas discussed in succeeding paragraphs, under a central organizational authority.

1. *Shelter*.—At present, responsibility for the functions that now make up the shelter program area are assigned to FCDA. The Atomic Energy Commission and Department of Defense conduct research that can be applied to non-military defense problems. FCDA's staff draws on this research; determines the additional types of research needed; conducts or sponsors such additional research in Government institutions, universities, or private laboratories; assesses results, and utilizes them in considering proposals for shelter construction. Although sufficient knowledge of weapons' effects and of shelter design now exists to permit proceeding with a complete and effective fallout shelter program if this were deemed desirable, expanded research is necessary to refine our knowledge, and develop more economical and efficient shelter models.

These functions and the development of proposed policies and programs for approval by the President are functions properly the responsibility of a central directing and coordinating agency which must visualize total nonmilitary defense needs and propose steps to meet them. When and if the functions to be performed can be more precisely defined, particularly if it is decided that shelters should be constructed, the assignment of responsibilities should be reexamined. At that time, it may be appropriate to assign functions to one or more established departments. The Housing and Home Finance Agency, for example, might well be charged with the functions relating to site selection, contracting, and financing.

2. *Public information and education*.—FCDA is now responsible for developing widespread public understanding of the nature of a potential attack and of the actions that should be taken in an emergency. This involves:

(a) Developing material to facilitate public understanding of nonmilitary defense and to educate the public in proper emergency actions.

(b) Working with the organizations that operate the major communications mediums—press, radio, television, movies—and enlisting their aid to inform the public of plans and techniques.

(c) Channeling information to Federal agencies and to State and local governments with a view to securing common understanding of relevant facts, policies, and requirements.

(d) Working with schools, civic groups, professional groups, special organizations representing segments of the public (e. g., labor unions, industry groups), and other governmental agencies to enlist their aid in informing and educating their members or clientele.

To be effective the program responsibility must be placed in that agency which is in a position to visualize the effects of an attack and the total needs of the people to cope with it. Thus, the public information and education program area is properly the responsibility within the Federal government of the central directing and coordinating agency.

In discharging its responsibility, that central agency will be required to perform many functions itself. However, it should also utilize those other Government departments and agencies which are capable of reaching and dealing effectively with organizations or segments of the Nation that should be reached. For example, the Office of Education (Department of Health, Education and Welfare) has been and should continue to be used to work with State education authorities to contact the Nation's schools. Similarly, the Forest Service (Department of Agriculture), which has been assigned responsibility for the rural fire-control functions, should be utilized also for working with the States to inform their foresters and timberland owners of the probable effects of attack on their forests and plans they should make for protecting them.

3. *Training*.—FCDA now carries out functions relating to two types of training—leadership training for State and local officials and civil defense directors and skills training for individuals who have been assigned specific jobs for emergency operations (e. g., radiological defense technicians, rescue personnel).

To be effective, leadership training, like public information and education, should be the responsibility of the agency best able to visualize the effects of an attack and the overall needs for coping with it. Thus, leadership training functions cannot logically be delegated, but should be handled by the central directing and coordinating agency.

Responsibilities for skills training, on the other hand, should follow assignment of the function which it supports. The functions relating to the training of medical personnel in emergency medical techniques, for example, should be assigned to the Department of Health, Education, and Welfare (Public Health Service), which is to be assigned responsibility for developing plans and carrying out readiness measures relating to casualty care.

HELPING THE NONMILITARY DEFENSE ORGANIZATION TO BE EFFECTIVE

The assignment of functions to established departments and agencies, as indicated above, can provide a sound basic organizational framework for improving the Nation's readiness for a possible attack. To insure effective utilization of this basic framework in achieving improved preparedness, however, requires more than simply assigning functions to the departments and agencies. Adequate arrangements must also be made for:

1. Insuring that assigned functions receive adequate attention within the departments and agencies.
2. Providing needed executive leadership.

(a) Insuring adequate attention

Nonmilitary defense functions, because of their inherent nature, may conflict with the continuing peacetime functions of the agency to which they are assigned or they may get lost unless steps are taken to avoid the possibilities.

Conflicts with peacetime functions may conceivably arise when the nonmilitary defense functions are not clearly understood by personnel of the agency to which they are to be assigned. Many of these functions involve planning and preparing for a future eventuality, which everyone hopes will not take place. Such future activities, particularly if they are relatively small, may tend to fare poorly and receive inadequate attention in competition with larger, current programs that are subject to stimulation and testing in daily operation.

Adequate attention and aggressive development of the nonmilitary defense functions can be fostered by these steps:

1. Each function to be assigned should be carefully defined, its relationship to other nonmilitary defense and peacetime activities should be made clear, and the Federal Government's role should be spelled out so that the department or agency assuming the responsibility understands what it is to do.
2. Personnel assigned to nonmilitary defense planning functions in the national headquarters of the department should, insofar as possible, be assigned to those functions full time. They should be carefully oriented as to the objectives sought and their efforts should be closely directed.
3. An official with ready access to the head of the department or agency should be designated to exercise control and coordinate the planning functions assigned.
4. Top officials and their staffs throughout the department or agency should be thoroughly oriented as to the importance of the nonmilitary defense functions and how they will be carried out; they should be instructed to render assistance and support and to integrate them with regular programs wherever possible.
5. Adequate funds should be made available for supporting the staffs and activities that can be separately identified with the nonmilitary defense functions.

(b) Providing needed executive leadership

The assignment of nonmilitary defense functions, as indicated in preceding sections, emphasizes the need for a central organizational authority to direct and coordinate the functions assigned to the departments and agencies and to perform those functions which should be retained under a central authority.

Efforts must be made continually to insure that all nonmilitary defense functions are always appropriately assigned. Initially, for those program areas where assignments have been made previously by ODM and FCDA, it will be necessary for the President to authorize their continuance and then begin to redistribute them, to the departments and agencies as indicated. Periodically thereafter, as the functions evolve or as the capabilities of departments and agencies change, assignments should be reviewed with a view to assigning them to a department or agency as soon as the criteria presented earlier in this memorandum can be met.

In addition, persistent efforts must be made to insure that the departments and agencies perform their assignments effectively. Leadership, direction, and support must be given the nonmilitary defense job by and for the President. Nonmilitary defense functions cannot simply be assigned and forgotten. If this country's nonmilitary defenses are to be effectively built, the activities of the several Federal departments and agencies must be continually evaluated and coordinated by an agency having the fullest support of and acting for the President. In a succeeding memorandum the organizational changes that are needed to strengthen the organization for providing executive leadership for nonmilitary defense will be presented.

3. IMPROVED ORGANIZATION FOR EXECUTIVE LEADERSHIP OF NONMILITARY DEFENSE PREPAREDNESS

INTRODUCTION

This is the third of a series of memorandums presenting the results of our study of the organization of the Federal Government for the conduct of nonmilitary defense functions. It—

1. Pictures the need for more effective organization to provide executive leadership for the several departments and agencies and the State and local governments among which responsibility for nonmilitary defense preparedness activities are distributed.

2. Recommends steps required to provide improved organization for executive leadership, direction, and coordination.

Our first memorandum,^{*} after (a) identifying the problems resulting from existing organizational arrangements and (b) setting forth principles to guide organizational improvement, recommended that all nonmilitary defense responsibilities and authorities be vested in the President. That recommendation assumed the President would delegate these authorities to departments and agencies that can and will effectively discharge these responsibilities.

Following our first memorandum, the President stated in his budget message for 1959:

"* * * The rapid technical advances of military science have led to a serious overlap among agencies carrying on these nonmilitary leadership and planning functions. Because the situation will continue to change and because these functions transcend the responsibility of any single department or agency, I have concluded that they should be vested in no one short of the President. I will make recommendations to the Congress on this subject."^{**}

Our second memorandum dealt with the "Need for Clarifying and Expanding the Role of Established Departments and Agencies in Nonmilitary Defense." That memorandum (a) analyzed the functions to be performed under a comprehensive nonmilitary preparedness program, (b) recommended the assignments which should be made to existing Federal departments and agencies, and (c) identified the functions which should remain with a central organization, to assist the President in planning, directing, and coordinating the entire nonmilitary preparedness program.

PROBLEMS AND PRINCIPLES

Our analysis of the substance of nonmilitary defense and our appraisal of existing organizational arrangements reveals four major problems.^{**}

1. Two organizations, the Office of Defense Mobilization and the Federal Civil Defense Administration, reflect in their plans and operations conflicting responsibilities in planning for the control and use of national resources in event of an attack on the United States. This lack of clarity as to resource control planning responsibilities is, in part, the cause of confusion among Federal agencies and State and local civil defense authorities.

2. ODM and FCDA have each assigned nonmilitary functions and activities to existing Federal departments and agencies. FCDA delegations assign several departments and agencies major roles in planning human survival functions.

* The first memorandum was submitted in the form of a report entitled "A Framework for Improving Nonmilitary Defense Organization," dated December 31, 1957.

** The President's budget message for 1959, p. M45.

** For a more detailed description of these problems see report entitled "A Framework for Improving Nonmilitary Defense Organization," dated December 31, 1957.

Simultaneously, ODM delegations call for the use of department and agency personnel as the nuclei of emergency resource control agencies which, in turn, will perform functions delegated by FCDA. In significant instances departments and agencies are unable to discern where one delegation stops and another begins.

3. Two organizations, ODM and FCDA, are continually (a) developing mobilization planning assumptions and policies to guide Federal departments and agencies, and (b) coordinating mobilization plans and readiness programs of Federal departments and agencies. These overlapping responsibilities are a major cause of duplication and confusion in ODM and FCDA as well as other departments and agencies.

4. FCDA has experienced a lack of sufficient organizational stature to coordinate effectively the efforts of older and larger Federal departments and agencies.

Our analyses of the nonmilitary defense job, in addition, have reinforced certain principles—enunciated in our first memorandum—that should guide the efforts to improve the organization for executive leadership. These guiding principles are:

1. *The state of readiness required dictates assignments to existing governmental machinery.*—The unpredictability of an attack and the shortness of warning to be expected dictate that existing Federal, State, and local governmental machinery will of necessity constitute the basic structure to assemble, control, and manage available resources following attack. The degree to which specialized functions can be assigned to existing departments and agencies is a major consideration determining the organizational arrangements required.²⁷ This is determined by the existing state of knowledge as to the function to be performed (e. g., radiological defense), the extent to which policy is established (e. g., shelters), the nature of the function (e. g., public education), and the experience and capabilities of existing agencies (e. g., casualty care and the U. S. Public Health Service).

2. *The job of nonmilitary defense is integral.*—While responsibility for specialized functions can and must be delegated among departments and agencies, their several efforts must be integrated. The task of direction and coordination cannot be divided effectively for organizational purposes on the basis of time phases, geographical areas, subject or item or types of war. The problem of dealing with people as casualties or sufferers after an attack is simply one part of the total job of managing the Nation's resources in wartime.

3. *Organizational arrangements must be flexible.*—As changes occur in the concepts of war, in enemy capabilities, in the technology of defense, or in the probability of attack, existing organizational arrangements may necessitate change.

The extent it is deemed desirable, at any given time, to condition the citizens of the country for action under attack conditions, as well as develop maximum readiness through Federal, State, and local government, affects the question of organization. The decision has a significant affect on the personal involvement of the President and the extent to which organization needs to be established close to him—symbolically and physically.

In addition, whatever preattack organizational arrangements are developed for providing executive leadership for nonmilitary defense preparedness must be susceptible of coping with postattack conditions with a minimum of adjustment.

The factors identified above dictate the necessity of vesting responsibilities for all Federal nonmilitary defense activities in the President. He can then distribute responsibilities and change organizational arrangements as circumstances require.

4. *Continuous Presidential attention is required.*—The stakes involved are so great—national survival—and the actions that may be taken by Government of such consequence to citizens that the President must continually be informed of problems, resolve policy issues, and assume accountability for the adequacy of the entire nonmilitary defense preparedness program. His direction and leadership are required for the coordination of the nonmilitary defense functions delegated to Federal departments and agencies and those of State and local governments. This coordination of executive agencies and State and local governments is, by its very nature, a Presidential function. To discharge this function, the President requires adequate, institutional, staff assistance.²⁸

²⁷ The second memorandum in this series identified 5 criteria to determine what responsibilities can and should be delegated to existing Federal departments and agencies, and recommended that additional delegations be made in 8 program areas.

²⁸ For additional discussion of this point see report entitled "A Framework for Improving Nonmilitary Defense Organization," dated December 31, 1957.

RECOMMENDED PLAN OF ORGANIZATION

Our study of the substance of the nonmilitary defense job, of existing organizational arrangements, and of the principles that should guide the improvement of these organizational arrangements, lead to the conclusion that responsibility for executive leadership should be fixed in a consolidated civilian mobilization agency located in the Executive Office of the President. Hence, we recommend that ODM and FCDA be abolished and that they be replaced by an Executive Office agency to be known as the Office of Civilian Mobilization.²⁹ The accompanying chart, entitled "Recommended Organization for Civilian Mobilization," depicts the contours of this recommended plan of organization.

The Office of Civilian Mobilization will require regional staffs to (a) coordinate mobilization planning and readiness efforts of the Federal departments and agencies, including the military services, in the field, and (b) supervise and aid State and local governments in developing plans for the protection of citizens in the event of attack and for relating these plans with Federal activities.

GAINS TO BE ACHIEVED BY RECOMMENDED PLAN

This plan of organization has the following advantages:

1. It will eliminate conflicting responsibilities for planning the use of national resources in event of attack on the United States.

2. Federal departments and agencies will not be receiving the dual, and sometimes conflicting, assignments that are presently being made. It recognizes the integral and inseparable nature of nonmilitary defense and provides a single source to provide planning assumptions and policy guidance as well as direction, coordination, and leadership for the President.

3. By locating responsibility for planning and coordinating all nonmilitary defense activities in the Executive Office of the President, greater stature will be given to those who must continually ensure that Federal departments and agencies discharge the functions assigned to them.

4. The President will be provided with staff assistance, directly and readily accessible to him, on the whole gamut of his nonmilitary defense preparedness responsibilities.

5. It will provide for flexibility in (a) assigning responsibilities, (b) increasing or decreasing the degree of readiness as required by external circumstances, and particularly (c) coping with resource implications of continued cold war, limited war, world war without nuclear attack on the United States, or worldwide nuclear war.

6. Furthermore, this plan of organization will maximize the utilization of existing departments and agencies. Time will not be available in event of sudden attack to develop immediately and employ new organizations, regardless of how well they are planned. Existing departments and agencies must be prepared, to the extent practicable, to assist with wartime activities.

On the other hand, however, this organizational plan may be criticized on two bases.

1. *As a proponent for nonmilitary defenses it may not effectively serve in resolving conflicting claims for critical resources.*³⁰—The Office of Civilian Mobilization's responsibility for identifying needed nonmilitary defense programs and vigorously presenting the arguments for establishing such defenses, it can be contended, will cause officials of those departments and agencies responsible for military defenses and international programs to doubt its impartiality.

With the exception of the study of shelter needs and the operation of certain aspects of radiological defense, the major proponentlike, nonmilitary defense programs are presently, or can be, assigned to the regular departments and agencies. These departments and agencies then become the major proponents for their assigned nonmilitary defense functions. If they are also resource agencies, they will receive, analyze, and resolve competing requirements from all other using departments and agencies—Agriculture for food, Interior for fuel, Housing and Home Finance Agency for housing and the like.

At present there is no significant central programing and allocation of such resources as copper, steel, and aluminum, that were limited during World War II and Korea. The function of allocation now is limited, for all practical purposes,

²⁹ This title encompasses civil defense, nonmilitary defense, and the central production programing and allocating functions of the present Office of Defense Mobilization.

³⁰ Executive Order 10480 issued August 14, 1953, gives ODM the "central programing function incident to the determination of the production programs required to meet defense need" and "priorities and allocations" authority.

to the development of supply-requirements estimates based on various assumed wartime conditions. In addition, ODM does advise the President regarding diversion of materials from the strategic and critical materials stockpile and on the allocation of manpower between military and civilian uses, to the extent such problems arise currently.

In the event of a limited war, organizational arrangements for central programming, allocating, and control of resources (as now foreseen) can be built promptly to meet the economic and other impacts of increased military, civilian, and nonmilitary demands for goods and services.

In the event of a nuclear attack on the United States, central allocating and other economic control or stabilization machinery, as we have known it in the past, could not likely be operative for many months after the initial attack. In any event the kind of organization that could be constructed then should be developed by the Office of Civilian Mobilization.

It is not practicable to maintain standby control programming to be available and allocation machinery over a long cold war period. The job of the new Office of Civilian Mobilization is to plan for the establishment of such machinery—not necessarily to function in this capacity.³¹ This is merely one of a myriad of nonmilitary defense tasks that can and should be performed in the preattack period to increase our readiness.³²

2. *Certain functions of a type not traditionally performed within the Executive Office would be assigned to the consolidated agency.*—Two functions that would be assigned to the consolidated civilian mobilization agency raise questions as to the appropriateness of performance within the Executive Office. These are: (1) Informing the public as to the threat, defenses being established and actions required of individuals; (2) training State and local civil defense leaders and, hence, the direct relations with governors and mayors involved and the maintenance of a substantial field staff.

It can be argued that such functions would more appropriately be performed by an agency outside the Executive Office. However, these are natural functions for a central directing and coordinating agency. Furthermore, the function of keeping the public informed of the nature of the threat might better be performed by an agency close to the President—particularly when it involves the lives and property of nearly all or at least a large majority of the people. Prior to, during World War II, and since then, it was found desirable to establish emergency agencies in the Executive Office of the President with comparable responsibilities. No adverse results ensued. We see no reason for reluctance to assign to the Office of Civilian Mobilization functions of the kind listed above which are essential to support a program that might have serious national and international ramifications.

In summary, no one of these likely criticisms of a consolidated civilian mobilization agency stands up under critical analysis. The establishment of an Office of Civilian Mobilization within the Executive Office will materially improve existing organizational arrangements for the conduct of nonmilitary defense activities. It provides a plan of organization preferable to all of the alternative plans that have been advanced.

OTHER PROPOSED ORGANIZATIONAL PLANS

During the course of this study, we have considered various proposals that have been advanced for improving the organization of the Federal Government's nonmilitary defense functions. In our first memorandum we considered three alternative concepts of organization among which several proposals can be classified.³³

(a) *The dual-command concept*

This concept is founded on a belief in the separability of the defense mobilization and the civil defense functions in the postattack period. It assumes two lines of authority from the President to local levels, one for civil defense ac-

³¹ In a limited or general war part of the proposed Office of Civilian Mobilization might well serve as the initial nucleus of the mechanism by which the President directs the management of critical resources.

³² See the summary description of the substance of nonmilitary defense on pp. 433-434 of our memorandum on "The Need for Clarifying and Expanding the Role of Departments and Agencies in Nonmilitary Defense." Subsequent sections of this memorandum also elaborate on the functions of the recommended Office of Civilian Mobilization.

³³ See "Appraisal of Alternative Concepts" pp. 424-426 of our first memorandum "A Framework for Improving Nonmilitary Defense Organization," dated December 31, 1957.

tivities required during the immediate and postattack periods and one for the mobilization and control of resources required later for rehabilitation. The current organization problem is not in this area, but rather in the area of development and execution of readiness measures in the preattack period. In effect, the postattack organization concepts have confused our preattack organization.

This alternative would not solve the major problems that now beset the Federal Government's organizational arrangements for nonmilitary defense activities. It is not possible, as has been pointed out, to separate the nonmilitary defense planning job among agencies by time periods. It is not practicable to continue to maintain two lines of authority to the delegated departments and agencies and to the field. In short, we are convinced the nonmilitary defense preparedness of this Nation cannot continue to be divided between two agencies of the Federal Government.

(b) The executive-department concept

This concept is advanced in those proposals that suggest either the transformation of FCDA into an executive department, the merging of it with other agencies to form a new department, or the placing of it in an existing department.

Acceptance of this concept risks building up a duplicating standby department equipped to carry out nonmilitary defense activities. It denies the essentiality of utilizing the capabilities for nonmilitary defense in existing departments and agencies. It implies that a new department will be capable of resolving disputes and securing cooperation among existing and older departments. Experience denies this. Finally, it would tend to freeze organizational arrangements and make difficult the job of adapting the organization to changes in the techniques of war, in enemy capabilities, and in the technology of defense.

(c) The Executive Office concept

In our first memorandum we concluded that the character of nonmilitary defense as a function of Government posed a special need for centralized policy guidance, direction and coordination of activities of the executive branch by or in the name of the President. We concluded that it was essential that the President be provided with sufficient staff assistance located in the Executive Office. We have recommended in the foregoing pages how such staff assistance should be established.

In evaluating this organizational concept we have considered the alternative of creating a separate civilian mobilization agency, outside the Executive Office of the President, to direct and coordinate day-to-day operations throughout the executive branch under the direction of a new Executive Office agency that would be responsible for formulation of policies and the review of programs.*

After critical analysis, we have rejected this alternative organizational arrangement. It would not overcome major existing deficiencies in the organization for nonmilitary defense.

1. *Dual points of direction.*—This proposal would continue two nonmilitary defense agencies. Their respective responsibilities cannot be clearly defined, due to the inseparable character of the job, and Federal departments and agencies would continue to be subject to direction from two agencies in carrying out assigned nonmilitary defense functions.

2. *Less effective Presidential staff assistance.*—The President would not have a fully coordinated staff capable of aiding him to give leadership to and coordinate the Federal department and agencies on the whole range of nonmilitary defense preparedness activities.

3. *The lack of organizational stature.*—Responsibility for coordinating preparedness activities of established departments and agencies would be assigned to a lower ranking agency. In fact, the separate civilian mobilization agency described in (c) above would not even have the independent agency status that FCDA finds inadequate; its head would be viewed as the equivalent of a bureau chief.

We are convinced that the consolidated Office of Civilian Mobilization recommended above will best provide the executive leadership needed for nonmilitary defense preparedness.

* This proposal was developed and tested after the submission of our first memorandum.

PROBLEMS NOT COVERED BY THE STUDY

Every form of organization that could be considered within the limits of this study leaves some unresolved problems. The assumptions in regard to the potentiality of a long period of continued cold war, of limited war, or of direct thermonuclear attack on the United States; the extent to which all citizens should be mobilized and conditioned for behavior under disaster; the priority and preparation of financial and material resources which should be allocated to nonmilitary defense preparedness purposes; as well as many other questions, must be resolved by the President with the help of whatever staff and advisory instrumentalities he finds suitable.

For example, the Office of Civilian Mobilization would be responsible for formulating a shelter program. If, after adequate research and analysis, it should decide that a mass shelter program is desirable, it would make recommendations to the President covering the potential benefits, feasibility, material requirements, and costs.

Such recommendations require objective evaluation as to their intrinsic merit and in relation to competing and perhaps conflicting proposals covering other elements of national policy, objectives, and programs. What would be the relative assessment of such a shelter program, as contrasted with increasing military capabilities or stepping up nonmilitary international undertakings? What would be the effect on national manpower, material, and other resources in light of other national needs and availabilities? What would be the national and international psychological, social, and financial consequences?

Existing Presidential devices to secure staff help and advice include the National Security Council, the Council of Economic Advisers, the Bureau of the Budget, Office of Defense Mobilization, and a variety of special assistants.

The ODM has not been organized or staffed to play as significant a role in providing staff assistance as would have been desirable. The proposed Office of Civilian Mobilization should be equipped to make a greater contribution to the overall security posture of the United States—including the problems of a long period of continued cold war—than has been the case with two, often competing, agencies in the picture.⁸⁵

However, it must be fully realized that there will be occasions when the main problems cast up to the President will involve basic policies and issues among competing programs—military, nonmilitary, foreign, and civilian—which cannot be resolved by the proposed Office of Civilian Mobilization. These will have to be resolved by the President with the assistance of such staff devices as the National Security Council, Council of Economic Advisers, and the Bureau of the Budget—staff arms of the President concerned with across-the-board policies and programs.

Whether the Presidential staff services are adequate in terms of effectively equating and optimizing the use of United States resources for national and international objectives is beyond the purview of this study. The study does reveal that clearer decisions and guidelines are needed for whatever civilian mobilization agency may be brought into being than are now available to ODM and FCDA.

In addition, this study has focused on the problem of developing improved organizational arrangements for the direction and coordination of preparedness planning and the conduct of readiness programs in the nonmilitary defense field. However, our analyses indicate that the proposed Office of Civilian Mobilization, if it effectively carries out the role we propose for it, can become the nucleus for whatever staff assistance the President requires in coping with the results of a nuclear attack on the United States.

FUNCTIONS OF THE OFFICE OF CIVILIAN MOBILIZATION

The proposed Office of Civilian Mobilization would be responsible for effective performance of three major jobs.

1. Developing a frame of reference for mobilization planning and readiness programs.
2. Directing the preparation and coordination of operating plans and courses to meet various wartime contingencies.
3. Directing and coordinating peacetime readiness measures.

⁸⁵ This plan contemplates that the Office of Civilian Mobilization would be delegated by the President the National Security Act responsibilities previously assigned to the National Security Resources Board and now assigned to the Office of Defense Mobilization, including membership on the National Security Council.

(a) Developing a frame of reference

Effective mobilization and disaster planning at all levels of government must be based on realistic assumptions as to the types of wartime situations to be expected. Development of considered assumptions as to situations to be encountered in limited war, world war without nuclear attack, and world war with nuclear attack is a major function of the proposed Office of Civilian Mobilization. Performance of this function involves:

1. Development of planning assumptions based on enemy capability and weapons effect data in such areas as health, food, protective shelter—the whole range of mobilization plans and readiness measures. These assumptions would have to be approved by the President, through the National Security Council, as is presently the case.

2. Coordination of the preparation of supply-requirements studies to determine the availability of critical resources under various mobilization assumptions. These studies would include the requirements for all major wartime programs—survival operations, military operations, and support of Allied and neutral countries. The new agency would retain and be expected to exercise the ODM function of advising the President from the civilian standpoint on such resource allocation problems as the optimum level of military forces. Disagreements over planned allocations of critical wartime resources such as manpower, which the Office of Civilian Mobilization is unable to resolve, would have to be referred to the President or to such staff arm as he indicates.

3. Identification of the plans to be developed and the readiness policies and programs required, in the light of the planning assumptions and the supply-requirements studies.

(b) Preparing emergency operating plans

The proposed Office of Civilian Mobilization will need to prepare overall plans of responsibilities and functions to be performed by all agencies covering operations at local, State, regional, and National levels. The working draft of the national civil defense plan now under preparation by FCDA, is an example. Such plans, which are needed for the several types of wartime situations mentioned above, will need to be kept flexible and revised as the nature of the threat, technical developments, and other conditions change.

For the most part, operating plans should be prepared by other Federal departments and agencies and by State and local governments. The role of the Office of Civilian Mobilization is to insure that these plans are brought into existence, that related plans are coordinated, and that realistic tests and evaluations of the plans (such as the annual Operations Alert) are conducted. The Office of Civilian Mobilization must take the lead in actually preparing emergency operating plans only when—

1. No suitable Federal department or agency to which assignment can be made exists³⁶ (e. g., price controls).

2. The function or activity involves several departments and agencies (e. g., radiological defense) and no primary organization exists to which assignments can be made with assurance that the functions will be handled in a wholesided manner, and will properly reflect the interests of the several departments and agencies.

3. The function or activity is closely related to other responsibilities of the Office of Civilian Mobilization and essential to the effective discharge of these responsibilities (e. g., public information).

Our study identified the following areas in which the civilian mobilization agency must actually prepare emergency operating plans:

(a) Emergency public information and morale.

(b) Radiological defense.

(c) Civilian consumer controls, rationing.³⁷

(d) Price controls.³⁷

In preparing radiological defense operating plans the civilian mobilization agency can look to the United States Weather Bureau, the Civil Aeronautics Administration, and the United States Public Health Service for considerable

³⁶ See memorandum entitled "Need for Clarifying and Expanding the Role of Established Departments and Agencies in Nonmilitary Defense," pp. 435-436 for the criteria used in assigning nonmilitary functions to Federal departments and agencies.

³⁷ The Office of Civilian Mobilization should be responsible for preparing coordinated plans for the whole field of emergency economic controls, including production controls. With the exception of price and civilian consumer controls the Office of Civilian Mobilization can depend for substantial assistance on other Federal departments and agencies.

assistance. In the other three areas no existing department or agency can provide substantial assistance. Each area involves wartime functions of Government for which no counterpart agencies are maintained in periods of relative peace.

In addition to insuring the development of emergency operating plans for all major resource areas—manpower, material, production, communications, transportation, and energy—the civilian mobilization agency will be responsible for planning:

1. The emergency organization structure that will be required to meet various emergency situations at Federal, State, and local levels.³⁸ This will be done in collaboration with the United States Bureau of the Budget which has legal responsibilities related to the organization of the executive branch of the Federal Government.³⁹

2. The damage assessment and other types of economic data systems required to allocate critical resources such as medical supplies, food, and the like, to survival, economic rehabilitation, war production, and aid to Allied and friendly nations.

(c) Directing and coordinating readiness programs

In addition to emergency operating plans, the Office of Civilian Mobilization will be responsible for insuring that actions are taken in peacetime to reduce the Nation's vulnerability to an attack. Specifically, it would—

1. Identify, evaluate, and recommend the types of readiness policies and programs that are required—for instance, the development of a national shelter program and the stockpiling of selected categories of health and food items required in the survival period following an attack.

2. Insure that related readiness actions are coordinated—for example, food stockpiling with protective shelter—also that peacetime readiness actions are reflected in emergency operating plans. This coordination will have to occur among the Federal departments and agencies and among Federal departments and State and local governments.

3. Conduct those readiness programs, or aspects of programs, which it is not now feasible to assign to existing or new departments and agencies.⁴⁰ Our study revealed the following activities that fall in this category:

(a) Developing plans and actions to improve the national radiological defense and damage assessment reporting systems, and receiving, analyzing and disseminating national data reported over the present systems.

(b) Developing policies and programs, such as lines of succession and records protection to increase the capabilities of government to operate under emergency conditions—Federal, State, and local—and advising on the implementation of these policies and programs.

(c) Establishing the objectives of the Strategic and Critical Materials Stockpile, including (1) determining the types of materials and the amounts, and (2) developing policies on rotation, storage, and disposal. For stockpiling of medical, food, and other survival items, the Office of Civilian Mobilization will rely primarily on the departments and agencies concerned. It will review proposed programs and progress to insure that they are consistent with related programs.

(d) Developing and applying policies on the use of financial incentives to expand or protect mobilization related industries and governmental activities. This involves the use of powers similar to the borrowing authority under the Defense Production Act, issuance of tax

³⁸ The principle enunciated on p. 445 of this memorandum regarding initial dependence on existing organizations—Federal, State, and local—in event of sudden attack on the United States does not rule out the use of emergency organizations to control and manage war resources. It merely recognizes the reality of a sudden attack situation in which it will not be feasible to establish emergency organizations for some time following the attack. In a limited-war situation or general war not involving nuclear attack, it may be more desirable to establish emergency resource control organizations, particularly at the Federal level. However, this possibility must not detract from the objective of adequately preparing existing organizations to cope with the consequences of sudden attack.

³⁹ Budget and Accounting Act of 1921, as amended.

⁴⁰ These are not suitable for assignment to existing Federal departments and agencies due to the existence of one or more of the same three conditions that pertain to preparation of emergency operating plans by the Office of Civilian Mobilization.

amortization certificates under the Revenue Code, and Federal contributions to States and localities under the Federal Civil Defense Act.

(e) Reviewing and approving grant-in-aid programs proposed by departments and agencies, obtaining a single appropriation to the President therefor, and allocating funds to departments and agencies that will administer the grant programs. The Office of Civilian Mobilization will actually handle the review and approval of grant-in-aid funds for those functions that cannot be assigned to departments and agencies or for functions that have been assigned to departments and agencies which do not have a capability for administering grant-in-aid funds.

As indicated above, the Office of Civilian Mobilization would not be responsible for the actual conduct of most readiness programs. These would be assigned to existing departments and agencies; for example, supervision of shelter construction, if approved, to the Housing and Home Finance Agency and stockpiling of medical supplies to the United States Public Health Service, with assistance from the General Services Administration, the Veterans' Administration, and the Department of Defense.

In addition, many, if not most, of the readiness policies and programs would be initiated, developed, and recommended by the other Federal departments and agencies and by State and local governments. The job of the Office of Civilian Mobilization would be to (a) view, continually, the nonmilitary defense program in a whole sided manner to assure that nothing of significance is overlooked, (b) appraise the relative merits and costs of various policies and programs, and (c) follow up on assignments to departments and agencies to assure the President that they are being carried out in a timely and effective manner.

CONDUCTING MAJOR SUPPORT FUNCTIONS

To discharge effectively its responsibilities for mobilization planning and readiness the civilian mobilization agency must be responsible for—

1. The development and conduct of the overall nonmilitary defense public information and education program. This includes all activities undertaken to inform the public of the nature of the threat, the protections being built, and the actions expected of individual citizens. These activities range from communications to the public via the press, radio, television, or other mediums to the development of public understanding through the distribution by the United States Office of Education of materials to be used by State and local school systems in acquainting students with hazards and self-protective measures.

2. The development of a national nonmilitary defense training system at all levels of government, principally through reliance on State and local agencies and institutions. This will include (a) the conduct of leadership training for those local, State, and Federal officials responsible for nonmilitary defense planning and operations in their jurisdictions, (b) skills training in those cases where no primary Federal department or agency exists to which such training programs can be assigned—the only current example being radiological defense techniques and operations, and (c) provide related supporting services such as printing and reproduction, distribution of training materials and administration of federally operated schools needed for leadership and special training programs that cannot be assigned to other agencies.

3. The identification of mobilization planning and readiness problems that require additional research. In carrying out this function the Office of Civilian Mobilization would (a) coordinate the development of a governmentwide research program, (b) take steps to insure that the results of present and proposed research are reflected in the mobilization plans and readiness programs at Federal, State, and local levels, and (c) administer research contracts in those areas related to the Office's primary responsibilities and in new developing preparedness fields such as radiological defense.

CONDUCTING DEFENSE RELATED FUNCTIONS

Five functions now performed by ODM and FCDA are related in some manner, to nonmilitary defense:

1. Advising the President on assignment of radio frequencies to Government radio stations and assisting Federal departments and agencies with technical

radio allocation and assignment problems. This function is assigned to ODM which is assisted by the Interdepartment Radio Advisory Committee.

2. Providing policy guidance to the Department of Interior on the voluntary curtailment of oil imports.

3. Evaluating statistical data and internal information and making the arrangements for hearings on the importation of articles which threaten to impair national security. This is necessary in order to provide the President with the advice he requires to carry out his responsibilities under the Trade Agreements Act of 1955. This function is assigned by law to the Office of Defense Mobilization.

4. Developing policies and programs to solve such general economic problems as those of depressed labor areas through the placement of defense contracts. They are usually carried out through interagency committees.

5. Coordinating and directing the efforts and resources of the Federal departments and agencies in alleviating the effects of natural disaster in accordance with Public Law 875. This function is assigned to FCDA.⁴

Each of these five functions involves coordinating the efforts of several departments and agencies. Four of the five functions involve specific legal responsibilities which are now placed directly on the President and for which he has staff assistance.

These functions, we believe, are as appropriately assigned to the proposed Office of Civilian Mobilization as to any other Federal agency. This conclusion is arrived at with full recognition that these functions may require considerable top management attention and may detract from the attention available for non-military defense matters. This handicapping effect of the continued assignment of these functions to the Office of Civilian Mobilization can be limited by appropriate internal organizational arrangements and control.

ESTABLISHING THE OFFICE OF CIVILIAN MOBILIZATION

To create the proposed Office of Civilian Mobilization within the Executive Office, we recommend:

1. Taking the following steps by Presidential reorganization plan under the Reorganization Act of 1949, as amended:

(a) Transfer to the President functions vested by law in the Federal Civil Defense Administration and in the Office of Defense Mobilization or in the heads thereof.

(b) Establish an Office of Civilian Mobilization in the Executive Office of the President to perform such functions as the President may delegate or otherwise assign thereto.

(c) Authorize the President to delegate the functions transferred to him by reorganization plan.

(d) Authorize the appropriate transfer of the personnel, property, records, and funds of the Office of Defense Mobilization and the Federal Civil Defense Administration.

(e) Abolish ODM and FCDA.

2. Developing and obtaining Presidential approval of Executive orders to—

(a) Delegate to the Director of the Office of Civilian Mobilization those functions—

(1) Formerly delegated to the Director of ODM.

(2) Formerly the responsibility of the Administrator, FCDA, which were transferred to the President by the reorganization plan suggested in paragraph (1) above, except the functions prescribed in title III of Public Law 920.

(b) Delegate to the heads of other departments and agencies the authority to continue performing those functions previously delegated to them by ODM and FCDA, subject to the direction and coordination of the Director of the Office of Civilian Mobilization.

Over a period of time it will be necessary to issue additional Executive orders to realine the functions of the Office of Civilian Mobilization and the departments and agencies in accordance with the assignments recommended in this memorandum and our preceding memorandum entitled "The Need for Clarifying and Expanding the Role of Departments and Agencies in Nonmilitary Defense."

⁴ In certain types of natural disaster, Federal assistance is handled almost solely by a single department or agency; for example, relief of drought-stricken farmers by the U. S. Department of Agriculture.

In subsequent memorandums, we will describe the internal organization structure of the proposed Office of Civilian Mobilization and the field organization that it will require.

LIST OF MAJOR STATUTES AND EXECUTIVE ORDERS PERTAINING TO THE RESPONSIBILITIES AND AUTHORITIES OF ODM AND FCDA

ODM LEGISLATION

1. Reorganization Plan No. 3, June 12, 1953.
2. National Security Act of 1947, as amended, section 103.
3. Strategic and Critical Materials Stockpiling Act.
4. Commodity Credit Corporation Act, section 4 (h).
5. Federal Property and Administrative Services Act of 1949, section 204 (f).
6. Abaca Production Act of 1950.
7. Defense Production Act of 1950, as amended.
8. Trade Agreements Extension Act of 1954, as amended by section 7 of the Extension Act of 1955.
9. Defense Housing and Community Facilities and Services Act of 1951.

ODM EXECUTIVE ORDERS

1. Executive Order 10193 (old ODM authority).
2. Executive Order 10480, as amended (codified authority of ODM contained in previous Executive orders dealing with DPA powers: 10433, 10471, 10489, 10537, 10574).
3. Executive Order 10460 (telecommunication standards and policies, IRAC).
4. Executive Order 10524 (defense activities related to school construction as amended by Executive Order 10592).
5. Executive Order 10539 (Abaca quotas; see also Executive Order 10553).
6. Executive Order 10553 (amends Executive Order 10539).
7. Executive Order 10634 (loans to aid in reconstruction of rehabilitation of defense related facilities destroyed or damaged by a major disaster).
8. Executive Order 10660 (executive reserve program).
9. Executive Order 10705 (emergency powers over communications).
10. Of lesser significance are: Executive Orders 10169, 10219, 10224, 10276, 10312, 10346, 10360, 10421, 10438, 10456, 10461, 10467, 10475, 10560, 10582, 10593, 10638.

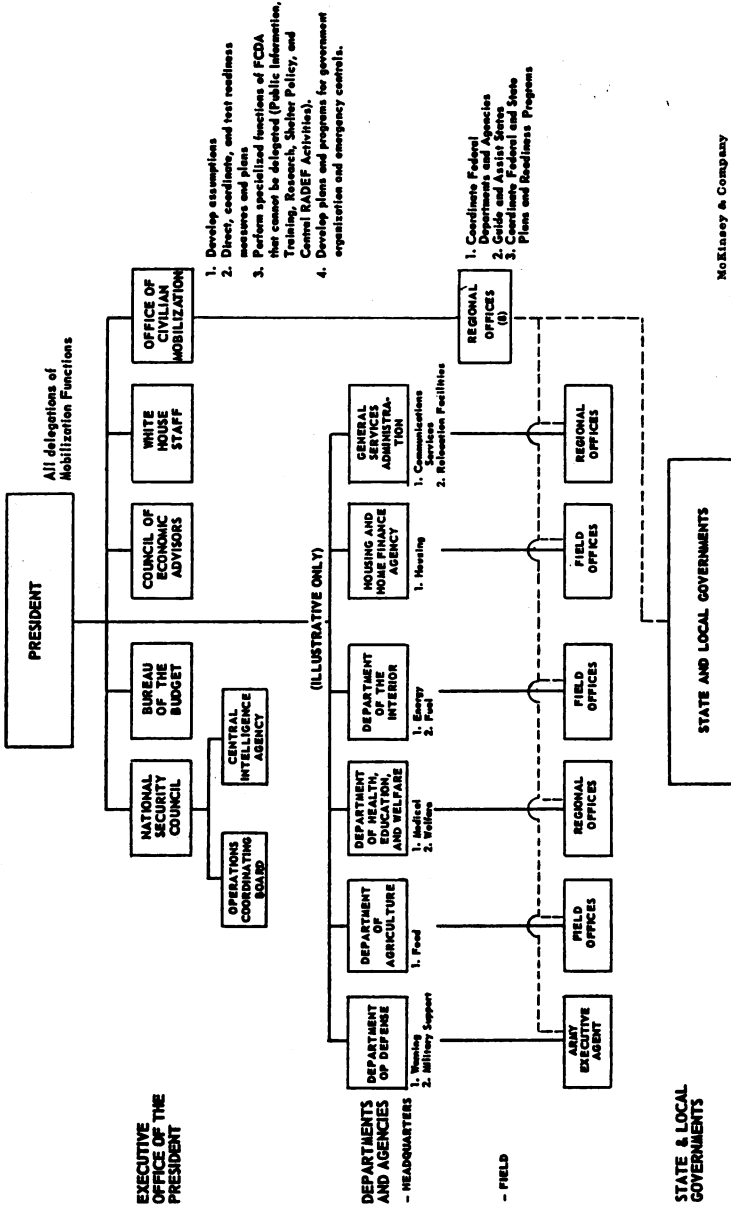
FCDA LEGISLATION

1. Federal Civil Defense Act of 1950, Public Law 920.
2. Federal Disaster Law, Public Law 875.

FCDA EXECUTIVE ORDERS

1. Executive Order 10346 (preparation by Federal agencies of civil defense emergency plans).
2. Executive Order 10529 (participation by Federal employees in State and local civil defense preemergency training programs).
3. Executive Order 10611 (establishing the Civil Defense Coordinating Board and defining its duties).
4. Executive Order 10427 (conferring on Administrator of FCDA the President's authority to direct and coordinate Federal assistance in major disasters).

RECOMMENDED ORGANIZATION FOR CIVILIAN MOBILIZATION



McKinsey & Company

4. TASKS AND ORGANIZATION IN THE FIELD IN BUILDING NONMILITARY PREPAREDNESS

INTRODUCTION

This is the fourth in a series of memorandums presenting the results of a study of existing organizational arrangements for conducting the Federal Government's defense mobilization and civil defense functions. Three previous memorandums have dealt, in turn, with the—

1. Framework for improving nonmilitary defense organization.⁴²
2. Need for clarifying and expanding the role of Federal departments and agencies in nonmilitary defense.
3. Organization for executive leadership of nonmilitary defense.

A fifth and last memorandum will discuss the internal organization of a recommended Office of Civilian Mobilization.

This memorandum describes and analyzes the substance of the nonmilitary defense job in the field. It indicates what is being done and what should be done in the field by local, State, and Federal governments, how collaboration must be effected among these governmental units and particularly the extent to which local and State governments require Federal leadership and assistance.

On the basis of this analysis, we recommend that—

1. The existing field staffs of FCDA and ODM be merged, and that a single field staff reporting to the Director of the newly established Office coordinate the nonmilitary defense activities of Federal agencies in the field and stimulate and coordinate the efforts of State and local governments.
2. Consistent regional boundaries be established for agencies with vital nonmilitary defense responsibilities.

NONMILITARY DEFENSE BY LOCAL GOVERNMENTS

It is in the cities, towns, and counties where the people live and work that nonmilitary defenses must exist if an attack occurs. It is for these areas that arrangements for evacuation or shelter, utilization of food and medical supplies, and other nonmilitary defense arrangements will have to become effective. The major nonmilitary defense activities that must be performed, and their interrelations, are depicted in exhibit I.⁴³ It is for these activities that capabilities must be built.

(a) *Nonmilitary defense tasks*

Nonmilitary defense places on the local government five major responsibilities: Learning as much as can be made available by Federal authority about the threat and countermeasures, developing specific plans of action suitable for the area, building capabilities into every relevant governmental department and private organization, establishing working relationships and coordinated operations with State and adjacent governmental units, and keeping residents informed of what should be done by and for them.

State and Federal agencies are logical sources from which local governments can learn what must be done to protect lives and property from the blast, thermal, and radiological effects of modern weapons that the enemy is capable of applying. Local governments must also depend upon Federal agencies for furnishing such services as meteorological forecasting that will be essential in an emergency and for which no capability exists below the Federal Government.

The people must be told what to expect, what to do, and what will be done for them in event of attack. To do this, mayors, other local chief executives, and local civil defense officers must know how attack warning will be provided and what steps should be taken to protect and care for the people of their communities. Realistic survival plans must be developed with the help and guidance of Federal and State authorities. Steps must be taken in advance to make it possible for plans to work. Plans for excavation (or other forms of protection) and for feeding and sheltering the homeless must be developed, kept up to date,

⁴² Submitted on December 31, 1957, as a report entitled "A Framework for Improving Nonmilitary Defense Organization" presenting the results of the first phase of this study.

⁴³ This exhibit is based on materials prepared by FCDA in the course of developing a national plan for civil defense against enemy attack.

and rehearsed. Sources of water and power must be protected. Duties must be assigned to police, health, public works, and other existing governmental service units. Telephone companies, contractors, transportation services, the Red Cross, and other private institutions must be called upon for assistance. Zoning and construction ordinances may require revision to encourage reduction of hazards. Radiological monitoring devices, and other special equipment, supplies, and funds must be obtained. These and many other problems confront local executives and civil defense directors. Their range extends, to answering such questions as "What do we do with pets if evacuation is ordered?"

(b) Local civil defense organization

The local organization for coping with the broad range of problems varies. Increasingly, however, State legislation and municipal ordinances have enabled the integration of nonmilitary defense activities into existing governmental structures. In most instances the mayor or other chief executive is ultimately responsible. He is normally authorized to appoint an advisory council and a civil defense director to assist him.

Advisory councils are often consulted prior to undertaking unprecedented actions or major programs that may have an impact upon the regular services of the local government or the population generally. In addition, some councils are empowered to review and enact proposed rules and regulations pertaining to civil defense matters. These councils generally consist of the heads of police, health, and other governmental units and community organizations (e. g., Red Cross) that must be employed in an emergency. Consequently the council provides a convenient means for coordinating emergency activities of all participants.

The civil defense director assists the mayor or other local chief executive in supervising and coordinating nonmilitary defense activities or in obtaining needed assistance from higher authority. Such governmental units as police, fire, health, water and utilities, public works, welfare, and supply must be equipped to conduct essential functions in an attack with their own forces or with auxiliary forces, if needed.

The local civil defense director is responsible to the chief executive to insure that an emergency will be met by the concerted action of all local agencies. To aid him the local civil defense director normally is assigned specialists from each of the government departments having emergency responsibilities.

(c) Relationships with adjacent and other governmental units

Local governments have limited capability for coping with disaster situations. Large cities, for example, may be able to mobilize whatever people are available to reconstruct damaged facilities within the city. Many cities, however, do not have within the area all materials, food, or other resources needed in an emergency. In many instances a local community is dependent upon private or public concerns located outside its jurisdiction or its State for such basic items as water, fuel, and power. In such cases, local governments must collaborate with adjacent governmental units, the State, and the Federal Government.

Such collaboration is particularly essential in metropolitan target areas because an attack will likely be directed at centers of industry and population. These areas often contain a score or more of local governments and extend over parts of two or three States. Coordinated action is essential on such matters as water supply, medical services, police protection, power, receiving and caring for evacuees, and disposal of casualties. In addition, responsibilities must be fixed in advance to minimize the chaos and confusion which would accompany an attack.

For instruction, guidance, and assistance in framing coordinated and joint civilian mobilization plans, local governments depend upon State and Federal authorities. Local governments also rely upon State and Federal agencies for assistance in training, in removing legal obstacles, in providing supplemental funds and equipment, in resolving interstate problems, and providing warning of attacks and other services it is not feasible for them to perform. The Federal Government has a special responsibility to foster coordinated plans and operations where metropolitan areas cut across State lines.

NONMILITARY DEFENSE BY STATE GOVERNMENTS

(a) Nonmilitary defense tasks

The extent to which States have taken comprehensive readiness measures varies considerably. Where preparation has been actively sought, attention has centered on plans for emergency operations by local agencies such as those for the control and allocation of manpower, transportation, food, clothing, medical supplies, fuel, and other essential resources. Attention has also been given to educating the population; training such regular and special employees as policemen, firemen, and radiological monitors; identifying critical survival items and providing for their availability by stockpiling and other measures; receiving and transmitting warning and other emergency communications; and integrating local and State readiness activities with those of neighboring States and the Federal Government.

Each State government must build emergency capabilities into its departments, agencies, and institutions. These capabilities must also be utilized in assisting towns, cities, and counties, and stimulating action at this level. In addition, State agencies provide a link between the capabilities of local and Federal Governments. In other words, State responsibilities are diffused horizontally in relation to its agencies and neighboring States and vertically in relation to local communities and to the Federal Government.

(b) State civil defense organization

As in the case of local governments, State civil defense organizations vary in concept, size, and internal structure. By virtue of his position, the Governor must be responsible for preparations and operations, functioning under the powers vested in him by the State constitution and legislation.

To handle this responsibility, the Governor needs adequate staff able to assist him in mobilizing the resources and coordinating the activities of State departments and local agencies concerned with civilian defense. This problem parallels that of Federal organization described in previous memorandums.

In some instances, the role of assisting the Governor in these matters has been assigned by the Governor to the adjutant general or another official in addition to his regular duties. On the other hand, many governors have appointed civil defense directors to do the job in their behalf. In any event, the ideal State organization provides for building emergency capabilities into the framework of its regular departments and agencies. It provides for continuing its executive, legislative, and judicial operations during an emergency.

For this purpose, some States have established a legislative or policymaking council to exercise such emergency authority as establishing or recommending policies and directives that have the effect of law. The typical State civilian defense council, chaired by the Governor, may include the Lieutenant Governor, attorney general, key leaders of the State legislature, and prominent State citizens. Its powers may include control and utilization of all resources and facilities in a State for emergency purposes, conscription of persons for emergency duties, the closing of State banks, rationing of food and other consumer goods according to or in lieu of Federal regulations, and enacting special rules and regulations.

Within this framework the State civil defense director oversees the conduct of day-to-day organization, planning, training, and other emergency preparatory activities. He normally has a staff to assist him in four major fields: (1) manpower; (2) intelligence; i. e., obtaining information on emergency conditions; (3) planning the operations of police, fire, rescue, public works, and other specialized staffs, and training all or key members of these staffs; and (4) supply, e. g., planning and taking such actions as stockpiling to provide food, transportation, medical items, water, fuel, and power.

To facilitate the conduct of operations in an emergency and to increase local capabilities, many States have supplemented their organizations by creating county, area, or other geographical echelons. These areas may be staffed with a small number of State officials, officials of an existing local emergency organization, or a combination of State and local officials.

(c) Relationships with other State governments

In addition to the intimate working relationships with local governments that have been described, State governments must collaborate with or obtain assistance from neighboring States to prepare for sheltering people or receiving evacuees, for providing food, power, medical supplies, manpower, and other resources,

and for avoiding conflicts in plans for emergency operations. For these and such other purposes as enabling doctors to treat people regardless of licensing restrictions, interstate compacts have been entered into by a number of States.

(d) Relationships with Federal agencies

State governments are dependent upon FCDA, for example, for information on the nature of the threat and the measures to be taken to cope with it. Often FCDA has been unable to provide unclassified guidelines which reflect national authoritative assessment of the probability of character of the potential attack and its effect. As a result the planning assumptions followed by the States and localities have not been supported by a solid foundation of Presidential, congressional, and citizen opinion. In part, this is a byproduct of the assumption of Public Law 920 that civil defense is primarily a State and local responsibility. Yet, as the character of the threat has changed from the possibility of isolated damage to the possibility of total national disaster, States and cities have become increasingly dependent upon Federal direction and assistance.

The Federal Government is the sole authority on modern nuclear weapons and their destructive power. The States cannot be expected to conduct studies and research on weapons, their effects, and countermeasures. They must rely upon the Federal Government for information and guidance in these areas. States must also look to the Federal Government for warning and for mobilizing transportation, communications, meteorological services, and other national resources or services over which the States have no control. Furthermore, the States must seek Federal aid when their plans involve ports, harbors, communications, transportation, and airports that are controlled by the Federal Government or other State governments. Along the northern border international problems can be resolved only through the collaboration of local, State, Federal, and Canadian governments. These and related limitations on State capabilities are borne out in every flood, hurricane, and other natural disaster.

Federal assistance is obtained by the States through FCDA's seven regional offices and the regional organizations of other Federal departments and agencies. On such matters as warning, States receive assistance from the FCDA through its regional offices. In some aspects of the construction of private plants for certain defense purposes, private firms or industries deal directly with ODM, the Department of Defense, and other Federal agencies in Washington. The diffusion of responsibility for the necessarily complicated nonmilitary defense program among Federal departments inevitably results in complex relationships between the Federal and State Governments. Confusion is also inevitable where relationships lack definition and clarity.

The extent of this confusion is illustrated by the plan of one State to control all transportation within its boundaries in the event of devastating or widespread catastrophe. It is fully aware that this will deprive neighboring States of essential services and supplies. However, without a clear understanding of its responsibilities in relation to those of the Federal Government and of what Federal plans exist for the utilization of interstate transportation, this State feels that it must take such steps as it deems appropriate under the circumstances until higher authority acts.

Similar uncertainties exist in numerous other areas. FCDA is attempting to clarify responsibilities among all echelons of government. But to date confusion has not been eliminated; few, if any, wholly effective plans or readiness measures exist.

REGIONAL OFFICES OF FEDERAL AGENCIES

Technically, it may be said that the Federal Government is not responsible for the lack of State plans or weaknesses. Under Public Law 920 its general responsibility is to "provide necessary coordination and guidance." Nevertheless our first memorandum (pp. 419-420 report on phase I of this study) and our third memorandum⁴ reveal that the nature and substance of the civil defense and mobilization jobs are interrelated and require participation by numerous agencies at all levels of government. The focal point of the job remains at the local level, but building nonmilitary defenses inevitably involves the State and Federal Governments. Hence, there is need for effective organization to relate the needs and plans of local governments and State governments with those of the Federal Government.

⁴ Improved Organization for Executive Leadership of Nonmilitary Defense.

(a) Federal nonmilitary defense tasks in the field

The Federal Government's mobilization role in the field is twofold: (1) to satisfy national needs through such agencies as law-enforcement organizations that supplement Federal forces in enforcing law and regulations for the control and utilization of resources in the national interest, and (2) to assist or service State and local governments through such agencies as the FCDA in civil defense; the Department of Health, Education, and Welfare in health, medical, and other services; and the Department of Labor in helping to mobilize civilian manpower for whatever need a local emergency may present.

Such diffusion of mobilization responsibilities among Federal agencies in the field, as at the seat of the Federal Government, creates an imperative need for coordinating and concerting the efforts of all agencies involved. In addition, the Federal Government must:

1. *Stimulate action through central executive leadership.*—Persuade governors, mayors, and State and local civil defense directors to act. Inform them of the nature of the threat and the scope of their responsibilities. They must be convinced of the need to install warning and emergency communications systems, to develop plans for evacuating or sheltering and caring for the people, to disperse or relocate vital public and private agencies, and to collaborate with neighboring jurisdictions for the exchange of essential services and support.

2. *Guide and assist State and local officials with preattack and postattack problems.*—State and local civil defense directors must be aided in understanding the unique administrative problems involved in protecting a State or a community's residents and the best solutions developed to date. Plans for feeding or evacuating people must coincide with transportation capabilities and plans as well as medical requirements and plans. Such plans must be consistent and integrated not only from the national to the local level but also as between and among different agencies and political jurisdictions. Furthermore, the States and localities must know, for example, what types of warning and communications devices to buy, how to locate and install them, and how to operate them. The States must also have a focal point to resolve problems in such areas as transportation over which they have limited control and which involve several agencies of the Federal Government.

In addition to assisting State officials with specific nonmilitary defense problems on request, FCDA has taken the initiative in launching programs within the States in specific areas of activity. In the past few years, for example, it has entered into contracts with the States to help them develop comprehensive plans for coping with possible attack situations. This required the preparation of guidance material, standards, and attack assumptions. It also required consulting with State officials to help resolve peculiar problems and reviewing State plans to insure conformance with standards. Currently FCDA is assisting the States in undertaking steps to provide for continuity of their government operations in event of an attack and to become equipped and competent in meeting the hazards of radiological fallout.

3. *Develop a regional plan for emergency operations and for resolving conflicts.*—Under present assumptions, regions within the United States might become isolated from the seat of the Federal Government in the event of an attack. These assumptions mean that each region must be equipped to maintain the processes of government in emergencies. Law and order must be enforced. Military combat operations and military activities in support of civilian activities must proceed consistent with regional requirements and capabilities and under civilian authority. Likewise, civilian emergency operations must receive appropriate attention and adequate machinery must exist to resolve any conflicts that may arise within civilian and military organizations and between them over the use of such resources as manpower and warehouse stocks. Similarly, assuming that no regions are cut off from the seat of the Federal Government, regional structure and machinery must exist to prevent conflicts from "floating" unnecessarily to the seat of National Government. In summary, organizations and plans must be developed, tested, and refined to provide for a maximum degree of self-sufficiency in regional areas in the event of attack.

(b) Deficiencies in existing Federal regional offices

Effective conduct of the foregoing tasks in the field is hampered, in part, due to the relative newness of civil defense. However, most problems encountered in the field can be attributed to the following factors:

1. Two organizations—ODM and FCDA—have nonmilitary defense responsibilities that cause overlap in the field as well as at the national level.

2. Consistent and coordinated national program direction and support is not available to field agencies.

3. ODM and FCDA field staffs lack the stature required by the character of the nonmilitary defense job.

4. Regional boundaries of agencies that must contribute to nonmilitary defense efforts vary widely in number and pattern.

5. Insufficient funds have been made available for stimulating actions that can be taken only by State and local governments.

The problems, uncertainties, and other major deficiencies in the field that result from these factors are discussed below.

Two coordinating mechanisms.—Two groups—FCDA's regional offices and their regional civil defense operations boards in each of its 7 regions and ODM's regional mobilization coordinators and committees in each of its 10 regions—exist to coordinate Federal planning and preparedness activities in the field. The respective responsibilities of these two agencies are not clearly delineated at the headquarters level. This problem was identified in our report on phase I of this study. Further study has revealed a succession of inconsistencies, conflicts, and gaps in the field that result from the overlapping and duplicating efforts of these agencies.

Inconsistencies occur in field assignments made to Federal departments and agencies by FCDA and ODM. FCDA plans to use existing departments and agencies, but ODM plans to employ elements of these agencies—often the same elements—as nuclei for emergency organizations. In Operations Alert, when State officials received copies of directives issued by such emergency organizations as NPA and EMA,⁴⁵ they could not determine the origin of these directives because ODM's emergency organization plans bear security classifications.

Conflicts have occurred between Federal, State, and local agencies over the acquisition of relocation sites. Such conflicts arise because FCDA provides guidance to State and local governments on continuity of operations, but ODM guides the Federal agencies. No single Federal agency in the field has clearly defined responsibility for seeking resolution of such conflicts.

Inadequate program direction and support from the national level.—The existence of two agencies with overlapping nonmilitary defense responsibilities leaves no one in a position to develop an overall central program. As a result, supporting nonmilitary defense programs cannot be developed effectively. Thus, Federal field agencies, and the States and localities have no guidance that comprehends the total job of nonmilitary defense.

FCDA advises State and local governments, for example, on evacuation and other survival activities as well as on the utilization and allocation of resources for survival activities. Such resources include highway, rail, and water transportation, materials, and manpower for survival operations. Simultaneous guidance has not been available to the States on the restoration of production and related vital facilities.⁴⁶

The uncertainties experienced by Federal departments and agencies due to overlapping or duplicating delegations by ODM and FCDA (see our first memorandum) are reflected in the field. In some instances, the national plans and programs of different agencies are not advancing in a balanced fashion. Consequently, field representatives of many Federal agencies have not received clear direction from headquarters in many instances and their activities are not in balance.

The progress that has been possible under present organizational arrangements is inadequate. The Department of Labor, for example, has published and distributed a manual to guide State employment service officials and it is analyzing jobs required to perform disaster services. These accomplishments, as well as progress by HEW, Interior, and other Federal agencies, fall short, however, of the assistance and needs of State and local officials. Moreover they do not often

⁴⁵ NPA refers to the production agency which has been called the National Production Agency in the ODM emergency organization plans; EMA refers to the Emergency Manpower Agency.

⁴⁶ This is confirmed by ODM's budget estimates for fiscal year 1959, which state: "It has become increasingly clear that previous plans affecting the field relationships of key mobilization agencies need revision to provide single integrated direction of Federal activities in any given area * * *. Attention [must] also be given to the practical problem of ways to utilize the broad police powers of State governors for maintaining law and order, while at the same time, making available the resource mobilization authorities, manpower, material, and services of the Federal Government at the point of need."

reflect realistic acceptance of the assumption that disaster may paralyze the Nation. However, it must be recognized that Federal delegate agencies have received inadequate or no funds to perform the mobilization tasks assigned them.

Recent need for increased stature.—As the advent of the hydrogen bomb and ballistic missiles has made the potential devastation of an attack with little or no warning increasingly apparent, the need for organizational arrangements in the field to effect coordination both among Federal agencies and between Federal, State, and local governments has become obvious. A large number of Federal departments and agencies have become involved in nonmilitary defense preparations and the need for coordination of their efforts has grown apace. Governors, mayors, leading citizens, and groups in local communities have become increasingly aware of the problem and involved in preparations.

The task of bringing Army area commanders and their staffs together with regional and field representatives of the civilian departments and agencies and concerting their actions involves greater responsibilities than those envisaged in 1951 when the FCDA regional offices were established. Military-civilian relationships must be clarified. Plans to utilize military capabilities in such specific areas as organizing private contractors for debris clearance should be developed. Military authorities have testified to the effect that “* * * in this initial phase, which we call the atomic offensive phase, no ships will be leaving our ports, no troops will be leaving this country until this slugfest or atomic offensive is completed, and we need everything we have got in this country to clean up the debris and prevent chaos * * *.”⁴⁷ Consequently, it is essential that military and civilian planning activities be coordinated.

The present FCDA regional administrators, as officials of a Federal agency that is, at best, coequal with others, lack the organizational stature required to effect needed coordination. ODM's part-time staff in the field, detailed from other Federal agencies, similarly lacks essential stature. In addition, ODM and FCDA field staffs are handicapped by the lack of clearly defined jobs and of clearly defined relationships with one another and other Federal agencies.

Inconsistent regional boundaries.—The regional boundaries of FCDA and ODM are not equal in number to each other or to those of the Department of the Army. This arrangement is not satisfactory, and it is complicated by the varying uncoordinated regional patterns of other agencies which must contribute to mobilization and emergency operations. Differences in the numbers of regions are illustrated by the following table :

Selected agencies :	<i>Number of regions</i>
Post Office Department.....	15
Department of Labor.....	11
ODM.....	10
General Services Administration.....	10
Department of Health, Education, and Welfare.....	9
FCDA.....	7
Department of the Army.....	6
Housing and Home Finance Agency.....	6

These inconsistencies in Federal regional boundaries complicate the direction and coordination of regional activities. Difficulties have been experienced in resolving operational problems during test exercises, and also where an agency's field structure is organized along several functional lines that report separately and directly to Washington.

As a result, the Bureau of the Budget and ODM have collaborated in developing a proposal for relating the regional areas served to permit better coordination in the field. Based on the Army's 6 area commands, 8 regional areas have been developed by dividing the Fifth and Sixth Army area commands into 2 regions each.

Dilemmas encountered in resolving State and local problems.—In stimulating State and local governments to undertake protective measures Federal officials have had to rely largely upon persuasiveness. Yet present assumptions create problems beyond the capabilities of either the Federal or of State and local governments alone. Most local governments lack the financial and other resources

⁴⁷ Testimony of Gen. Nathan S. Twining before the Military Operations Subcommittee of the Committee on Government Operations in subcommittee hearings, pt. 2, p. 392.

required to meet their total requirements for preattack and postattack emergency programs. State and local survival plans, hence, were financed by FCDA through contracts with State governments because Public Law 920 makes no provision for Federal grants-in-aid to offset administrative and direct salary expenses.

In addition, FCDA and other Federal agencies, except HHFA, have few direct contacts with local governments or target areas that are most likely to suffer devastation in event of attack. Their contacts with such areas are now largely through State channels. Many such areas are metropolitan complexes and some extend into two or more States. Achieving concerted action in these areas has proven difficult or impossible. The lack of ways and means of providing financial aid to promote required and desired actions that cannot be taken by local officials alone has handicapped the preparation of adequate defenses.

Recognition of these problems is reflected in H. R. 7576. It would amend Public Law 920 by relieving local governments of primary responsibility for civil defense and by permitting the appropriation and use of Federal funds for matching up to one-half of the total cost of State and local civil defense personnel and administrative expenses. Such legislation will help to alleviate the problems encountered in stimulating State and local governments, and particularly the metropolitan complexes, to undertake effective nonmilitary defense programs.

If H. R. 7576 is enacted into law, as is desirable, the Federal regional organization for directing and coordinating mobilization and emergency activities of other Federal agencies in the field and for assisting State and local governments may have to be adapted to administer the grants-in-aid program proposed by that bill. In such event, the States will require more assistance with metropolitan target-area problems, and closer working relationships may have to be established between the Federal regional organization and local target areas.

IMPROVING FEDERAL REGIONAL ORGANIZATION FOR NONMILITARY DEFENSE

The foregoing analysis depicts the diffusion of responsibilities for nonmilitary defense among all levels of government and the services and resources that can be provided only by Federal agencies to meet State and local needs. It evidences a need for special organizational arrangements in the field. The major deficiencies in the present Federal regional organizations for conducting nonmilitary defense activities can be overcome by—

1. Creating a single regional organization within the single central civilian mobilization agency recommended in memorandum No. 3.
2. Adopting a consistent regional pattern for agencies having major responsibilities for nonmilitary defense programs in the field.

(a) Creating a single regional organization

The recommended Office of Civilian Mobilization should be provided with field organizations substantially similar to FCDA's regional offices. Such offices can be created by—

1. Replacing the existing regional organizations of FCDA and ODM with regional offices of civilian mobilization headed by a high-level regional director. Each regional office should be provided with an interagency committee similar to ODM's regional mobilization committees. Such committees should include representatives of Federal field agencies involved in nonmilitary defense activities to facilitate their coordination.
2. Transferring to the regional offices of civilian mobilization responsibilities now assigned to the FCDA and ODM field structures, including authority and responsibility for such general roles as—

(a) Stimulating, assisting, and coordinating State and local efforts and, particularly, concerting public and private agencies in interurban and interstate target areas when funds and personnel can be obtained for this purpose.

(b) Coordinating the nonmilitary defense activities of other Federal agencies, including the military services, with one another and with State and local agencies.

3. Organizing the regional offices of civilian mobilization to conduct, in appropriate relation to field structures of other Federal agencies, the specific categories of activities itemized below with illustrative functional statements.

(a) *Supply and requirements.*—Encourage States to make adequate provision for identifying their postattack requirement for such items as food, clothing, fuel, medical supplies, and equipment; assist State officials in establishing and applying methods, procedures, and basic doctrine applicable to such matters as the reduction of vulnerability and damage assessment within the framework of their complete nonmilitary defense program; coordinate relationships between and among State health, manpower, transportation, food, and other specialists and their Federal counterparts in the field, assist in resolving any conflicts that may arise between them; assist States in supply activities stemming from programs that have not been delegated to other Federal agencies.

(b) *Plans and operations.*—Coordinate State and interstate activities in planning for the conduct of postattack operations with similar activities of other Federal regional organizations and assist in testing and evaluating their adequacy; insure that adequate provision is being made within the States for emergency warning and communications systems and bridge the gap between Air Force and State officials; interpret national doctrine on the continuity of government operations and inspect activities, such as the construction of control centers, for conformance with grant-in-aid standards;⁴⁸ advise State, local, and Federal officials on plans for emergency economic controls and the role that must be performed by State and local officials; administer planning and other activities incident to the Natural Disaster Act; perform activities aimed at building training and operational capabilities within the States in such program areas as radiological defense that have not been delegated to other Federal agencies; supervise and coordinate all the Federal activities in the region incident to the development of regional nonmilitary defense plans (see par. 3, below).

(c) *Public information and education.*—Collect and release news information on nonmilitary defense that does not otherwise reach the news mediums and keep the Office of Civilian Mobilization informed of significant local news and comment; maintain public relations between Federal regional officials and such organized bodies within the region as medical, legal, and business associations as well as key State and local citizens; assist officials of other Federal agencies in establishing and carrying out specialized training activities for States and localities; render direct assistance to States in developing and conducting leadership and other general training programs and in obtaining such training from Federal agencies; promote the effective distribution and utilization of nonmilitary defense publications.

As an element of an agency of the Executive Office of the President, such a regional office will have the organizational stature to perform its major tasks in dealing with other Federal agencies and in representing the entire Federal Establishment in relationship with State and local governments on nonmilitary defense. It is essential that the regional civilian mobilization directors be high level, capable people with competence and compensation commensurate with their responsibilities for coordinating the activities of other Federal regional officers.

To assist him in carrying out his duties and responsibilities, the regional director should be aided by an advisory council whose chairman and vice chairman might be designated by the President from among nationally recognized leading citizens in each region. During the preattack period, the regional director of the office of civilian mobilization should serve as executive secretary of the council. In an emergency or national disaster, the members of the

⁴⁸ The regional office of civilian mobilization will be responsible for carrying on some grant-in-aid programs (i. e., disseminating Federal standards, specifications, and other information to the States, approving or obtaining approval of State applications, inspecting facilities and activities for conformance with standards). However, such activities will be conducted by the regional office in those program areas (a) that the Office of Civilian Mobilization is responsible for conducting because they cannot be assigned to departments and agencies (e. g., government organization control centers), and (b) that are assigned to departments and agencies which do not have the capacity to handle any related grant-in-aid activities (e. g., Air Force in warning).

council might provide leadership that would aid in such manner as would then be deemed necessary to direct the activities of all Federal agencies—civilian and military. In the event of such emergency or disaster the regional civilian mobilization director would serve as the principal staff assistant of whoever is chosen to represent the President and to direct the activities of all Federal agencies.

The council should advise and assist the regional director of the office of civilian mobilization on major policies and programs required within the region. Consequently, the council should have at least one member from each State. Ideally, the council should have no more than 20 members, and its membership should include 1 or more governors, mayors, or chief executives of metropolitan target areas, and the chief executives of major industrial or other significant groups in the region. To resolve local or special problems, subcommittees or special committees may be created.

(b) Staffing the regional office of civilian mobilization

The staffing pattern of the regional offices of civilian mobilization must be established on the basis of the functions to be performed. Those functions fall within two general categories:

1. Coordinating the nonmilitary defense planning and readiness activities that are assigned to other Federal agencies in the field, including the activities that these agencies must conduct in rendering assistance to State and local governments.

2. Conducting such planning and readiness activities as damage assessment that cannot be assigned to other Federal departments and agencies.

When activities have been assigned to other Federal agencies, and particularly in supply and requirements activities, the regional office staff should avoid complementing and duplicating the staff specialists of these agencies. Permanent staff members that are required in the regional offices of civilian mobilization for directing and coordinating manpower, medical, food, and activities in other resource areas should be high-caliber generalists. These regional offices should not employ, for example, a labor economist. They should rely upon the regional offices of the Bureau of Employment Security to conduct civilian manpower activities. The regional offices of civilian mobilization should concentrate on obtaining the required emphasis, perspective, and collaboration from and among other agencies' specialists with the skills to do the job at hand—not to conduct or supplement activities that are or can be assigned to other agencies.

Most of the activities in plans and operations and in public affairs will have to be conducted by the staff of the regional office of civilian mobilization. Hence, full-time specialists will be required for communications, warning, damage assessment, radiological defense, and emergency control. Yet, even in some of these areas, the regional office can and should obtain some assistance for special activities from other Federal agencies in the field. To handle problems in radiological forecasting, for example, it may obtain personnel from the Weather Bureau on loan or detail. Hence, even in activities that must be performed by the regional office, the objective should be maximum utilization of other agencies.

(c) Adopting a consistent regional pattern

Further action to adopt a plan which adequately coordinates the field pattern of all major agencies having nonmilitary defense functions is essential. Such a plan should appropriately recognize significant relationships between Federal field agencies and the field structure of the Army commands. All agencies with major nonmilitary defense functions in the field should adapt their organizations to the pattern adopted for nonmilitary defense to facilitate concerted action in the preattack and, particularly, the postattack periods.

The next and last memorandum in this series will discuss the internal organization of the Office of Civilian Mobilization and of its regional offices that have been recommended for carrying out nonmilitary defense tasks in the field.

EXHIBIT I
Diffusion and interrelationship of selected nonmilitary defense services

Assistance from to—	Health	Fire	Police	Rescue	Warden	Engineering
Health.....		Protection of medical facilities; first-aid assistance; detection and decontamination of chemical and biological warfare agents.	Traffic and crowd control at first-aid stations, hospitals, triage, burial sites; first-aid assistance; detection of chemical and biological warfare agents.	First-aid assistance. Detection of chemical, biological warfare agents.	First-aid assistance; emergency reception; flood sanitation.	Emergency light, heat, power, water, for medical facilities.
Radiological defense.....		Assistance in monitoring operating areas; assistance in decontamination.	Assistance in monitoring operating areas.	Assistance in monitoring operating areas.	Assistance in decontamination.	Assistance in decontamination.
Fire.....	Casualty transportation to first-aid stations.		Traffic control.....	Location of unexploded ordnance.	Fire prevention in reception centers and medical facilities; fighting small fires.	Debris removal, emergency water supply, floodlights, lightweight pipe, temporary bridges, etc.
Police.....	do	Information concerning spread, speed, and direction of fires; location of unexploded ordnance.			Assistance in traffic and crowd control; location of unexploded ordnance.	Debris removal, road and bridge repair; location of unexploded ordnance.
Rescue.....	Casualty transportation to first-aid stations; first-aid assistance; location of heavily trapped casualties.	Information concerning spread, speed, and direction of fires; location of heavily trapped casualties.	Traffic control, location of heavily trapped casualties.		Location of heavily trapped casualties.	Debris removal, floodlights, tools, road and bridge repair; location of heavily trapped casualties.
Warden.....		Information concerning spread, speed, and direction of fires.	Crowd control in shelter areas.			Emergency light, heat, power, and water in shelters.
Engineering.....	Safety of water, sewage and waste disposal practices.	do	Traffic control.			
Communications.....		do	Protection of lines of communication, control centers, etc.			
Welfare.....	Health services in mass care and reception areas.	Protection of assembly and reception centers.	Traffic and crowd control at assembly and reception centers.		Assistance in reception of evacuees.	Emergency light, power, water and heat at reception centers; provide emergency facilities.
Manpower.....		Availability of personnel for other assignments.		Availability of personnel for other assignments.	Availability of personnel for other assignments.	

Supply.....	Information concerning spread, speed, and direction of fires; protection of dumps, etc.	Traffic control; protection of dumps, etc.	Emergency light, heat, power, water at dumps etc.
Transportation.....	Information concerning spread, speed, and direction of fires.	Traffic control; protection of maintenance areas.	Emergency light, heat, power, water for maintenance areas.

NOTE.—All services coordinate with communications, radiological defense, welfare—for feeding, manpower and training, supply, and transportation. Other interservice coordination is charted above.

5. INTERNAL ORGANIZATION OF THE PROPOSED CIVILIAN MOBILIZATION AGENCY

INTRODUCTION

This is the fifth memorandum presenting the results of our study of organizational arrangements for the conduct of the Federal Government's defense mobilization and civil defense functions.

The first memorandum ⁴⁹ (a) identified problems resulting from existing organizational arrangements, (b) set forth principles to guide organizational improvement, and (c) emphasized that existing departments and agencies should be used to the maximum extent in carrying out nonmilitary preparedness functions. In addition, that memorandum recommended that all nonmilitary defense functions be vested in the President and that the President be provided with adequate staff to direct and coordinate the efforts of the several departments and agencies and of State and local governments.

The second memorandum (a) analyzed functions to be performed under a comprehensive nonmilitary defense program, (b) recommended the assignment of additional responsibilities to Federal departments and agencies, and (c) identified functions which should remain with a central organization to assist the President in planning, directing, and coordinating the entire program.

The third memorandum recommended that a new agency be established in the Executive Office of the President. The new agency, to be known as the Office of Civilian Mobilization, would be responsible for directing and coordinating, in behalf of the President, all nonmilitary defense functions assigned to departments and agencies of the Federal Government and for conducting those which cannot now be assigned. The functions that would be carried out by regional offices of the proposed Office of Civilian Mobilization were covered in our fourth memorandum.

The objectives of this, the fifth and last memorandum, are to—

1. Identify factors that must influence the development of the internal organization structure of the Office of Civilian Mobilization.
2. Present and analyze alternative forms of organization.
3. Set forth the steps required to implement the recommended form of organization.

PROVIDING A BASIS FOR INTERNAL ORGANIZATION

The functions of the Office of Civilian Mobilization, as set forth in our third and fourth memorandums,⁵⁰ can be classified in three major groups:

1. *Planning emergency resources management.*—In five key areas—(a) manpower, with special emphasis on utilization and expansion of the labor force, (b) health and medical facilities, manpower, equipment, and supplies, (c) production facilities and raw materials, (d) communications, including emergency communication systems and operating procedures, and (e) transportation, including air, highway, ocean shipping, pipelines, and port utilization. The activities involved in planning for the utilization in an emergency of these basic resources have been assigned to one, or a few, existing Federal departments and agencies. The Office of Civilian Mobilization's role is primarily one of stimulation and coordination.

2. *Developing operating plans unique to nonmilitary preparedness.*—In seven other areas there is the need for developing policies, facilities, systems, or capabilities that are peculiar to nonmilitary preparedness. The tasks involved concern many departments and agencies. No primary department or agency exists to which a total functional area can be assigned at this time. Our study identified the following functions that can be classified in this group—(a) emergency organization planning, (b) development of an emergency control framework, including prices, rents, wages, salaries, production, consumer goods, credit, and maintenance of a monetary system, (c) development of a radiological defense program, (d) development of a damage assessment system, (e) development of vulnerability reduction policies and programs, particularly protective shelter, (f) coordination of Federal relief in natural disaster, and (g) planning for emergency community services (fire, police, rescue, engineering).

⁴⁹ The first memorandum was submitted in the form of a report entitled "A Framework for Improving Nonmilitary Defense Organization," dated December 31, 1957.

⁵⁰ See pp. 444-447, Improved Organization for Executive Leadership of Nonmilitary Defense Preparedness, and p. 456, Tasks and Organization in Building Nonmilitary Preparedness, March 21, 1958.

The Office of Civilian Mobilization's role is to delegate such tasks in each of these seven functional areas as can be assigned and to develop through its own staff the additional policies, plans, facilities, systems, and capabilities that are required in each of these functional areas.

3. *Providing integrating services.*—A principal function of the Office of Civilian Mobilization is to visualize the whole of our nonmilitary preparedness. Particular functions will be planned by most Federal departments and agencies and by State and local governments. Their effectiveness will depend upon the capabilities of this Office in conceiving the nature of the threats to which this country is exposed and the nonmilitary preparedness measures that must be built, and in translating this conception into plans and public understanding. Hence, the Office is responsible for (a) overall planning (or conception) of the nonmilitary defense program, (b) research administration and coordination, and (c) conduct of public information, education, and training programs.

In developing the internal organization of the Office of Civilian Mobilization to accommodate these three major groups of functions the present basis for dividing the nonmilitary defense job between ODM and FCDA must be avoided. Our previous memorandums have pointed up the problems that are caused when responsibilities for the nonmilitary defense job are distributed among organizations on the basis of time phases, such as postattack and rehabilitation; geographical areas, such as damaged and undamaged; or types of war, such as limited and nuclear.²¹

The integral nature of the functions and activities that comprise nonmilitary defense was the primary reason for our recommendation that a unified, directing, and coordinating nonmilitary preparedness agency be created in the Executive Office of the President. These interrelationships must be reflected also in the internal organization of the Office of Civilian Mobilization. Unless this is done, Federal departments and agencies and State and local governments will continue to receive unclear and confusing leadership and guidance.

Consideration of this factor, in developing the internal organization of the Office of Civilian Mobilization, points to the desirability of combining ODM and FCDA activities in the following areas:

1. Development of planning assumptions.
2. Planning and coordinating the activities of delegate agencies in each of the major resource areas: manpower, production, and materials, health and medical, communications, and transportation.
3. Development of damage assessment analysis and reporting systems.
4. Development of systems to control critical resources under various types of emergency situations.
5. Continuity of government and emergency organization planning.
6. Development and conduct of test exercises such as Operation Alert.

In addition, two other major factors must be considered in developing an effective internal organization for the proposed Office of Civilian Mobilization:

1. Four activities require greater attention and emphasis than they have received in the past: (a) Overall program and policy development and analysis, (b) research coordination and administration, (c) development and coordination of specific plans for providing military support to civilian authorities during an emergency, particularly in the areas of maintenance of order and logistics, and (d) assistance to State and local governments in developing standard operating procedures and emergency courses of action to be followed by fire, police, rescue, and engineering services.

2. Related functions of the Office must be grouped in such a manner as to prevent excessive levels of organization. This is essential if key officials are to be given sufficient stature to enable them to effectively coordinate the nonmilitary activities of other Federal departments and agencies and of State and local governments.

ALTERNATIVE PLANS OF ORGANIZATION

Two alternative plans for the internal organization of the Office of Civilian Mobilization have been considered. These are pictured in the accompanying organization charts.

²¹ The basic responsibilities paper of January 3, 1956, was premised on the assumption that planning for immediate postattack relief and rehabilitation and resource mobilization (logistical support) are sufficiently separable to constitute a valid basis for the assignment of responsibilities and functions between ODM and FCDA. See pp. 415-416 of our report entitled "A Framework for Improving Nonmilitary Defense Organization" for a discussion of the problems that arise as a result of these arrangements.

The difference between these two alternatives is the manner in which the five resource areas are organized: (1) manpower, (2) health and medical, (3) production and materials, (4) communications, and (5) transportation. Alternative A groups all five resource areas in one organization unit, the head of which reports to the Director of the Office of Civilian Mobilization. In alternative B each of the five resource areas is given separate organizational identification, with the head of each resource area reporting to the Director. The organizational provisions for the other two major groups of functions that must be accommodated—(1) operating plans unique to nonmilitary preparedness and (2) integrating services—are the same in both alternatives.

Alternative A has two advantages over alternative B:

1. All resource areas are combined in a single organization unit thus providing (a) a point of coordination for the many interrelationships among the areas within the Office of Civilian Mobilization, (b) coordination of the supply and requirements assignments of the several departments and agencies, short of the Director himself, and (c) a focal point for direction and coordination of field activities in the five resource areas. The internal organization of the 8 regional offices, as depicted in the accompanying chart, provides for combining the 5 resource areas under a common head.⁵²

2. Provides a smaller span of control and thereby decreases the burden of the Director of the Office of Civilian Mobilization. In alternative A 8 headquarters officials would be reporting to the Director as compared to 12 in alternative B.

ORGANIZATIONAL PROVISION FOR RESOURCE MANAGEMENT

Alternative A has one major disadvantage which, in our judgment, more than offsets the two advantages set forth above. This plan subordinates the five resource areas to a degree that may seriously impair the ability of the heads of these areas to effectively stimulate and coordinate the work of the Federal departments and agencies. It is in the five resource areas, more than with any other program areas of the Office of Civilian Mobilization, that major reliance for effective preparedness planning rests with Federal departments and agencies.⁵³

The resource coordination and span of control problems created by alternative B, we believe, can be overcome (a) by providing the Director of the Office of Civilian Mobilization with a sufficient number of high-level aids to assist him in effecting needed internal direction and (b) by establishing a strong central program development and evaluation staff.

On the basis of this reasoning, we recommend the adoption of alternative B.

DEVELOPMENT OF OPERATING PLANS UNIQUE TO NONMILITARY PREPAREDNESS

The seven areas unique to nonmilitary preparedness (see p. 468) have been divided into two closely related groups of functions and activities: (1) Emergency organization and controls and (2) special operations.

In the emergency organization and controls group we have placed all those functions and activities which are closely related to developing the capabilities and plans for government organization at all levels—Federal, State, and local—to manage critical resources effectively under various national emergency conditions. These functions and activities include (1) emergency organization planning, (2) development and coordination of specific plans for providing military support to civilian authorities during an emergency, particularly in the areas of maintenance of order and logistics, (3) development of an emergency control framework, including prices, rent, wages, salaries, production, consumer goods, conduct and maintenance of a monetary system, and (4) development of test exercises such as Operation Alert.

In the special operations area the functions and activities related to providing unique nonmilitary preparedness services and facilities have been grouped together in the same organization unit. These include (1) development of a radiological defense program, (2) development of a damage assessment sys-

⁵² See memorandum No. 4 of this series entitled "Tasks and Organization in the Field in Building Nonmilitary Defense Preparedness" for discussion of the activities to be conducted in the supply and requirements program area.

⁵³ See memorandum No. 2 of this series entitled "The Need for Clarifying and Expanding the Role of the Departments and Agencies in Nonmilitary Defense Preparedness" for a discussion of the assignments to Federal departments and agencies.

tem, (3) development of vulnerability reduction policies and programs, particularly protective shelter, (4) provision of assistance to State and local governments in developing standard operating procedures and emergency courses of action to be followed by fire, police, rescue and engineering services, and (5) coordination of Federal relief in natural disasters.

In time it may be possible for the functions related to radiological defense, damage assessment, and shelter programs to be almost completely delegated to existing Federal departments and agencies, with only central direction and coordination remaining in the Office of Civilian Mobilization.

The relationships of the emergency, community services, and national disaster relief activities to the other functions and activities in the special operations area are such that they can be placed elsewhere in the organization without causing major problems of coordination.

ORGANIZATIONAL PROVISION FOR INTEGRATING SERVICES

Public affairs and information, public education, leadership training, technical training not suitable for assignment elsewhere, and publication and distribution constitute a homogeneous group of interrelated activities. Hence, we propose that these be organized into the Nonmilitary Defense Training Center and that the head of this Center report to the Director of the Office of Civilian Mobilization.

In the case of the other two integrating services—program development and research—our analysis of the substance of the nonmilitary preparedness program has revealed two deficiencies:

1. Inadequate overall program development, coordination, and evaluation, including progress reports.

2. Inadequate emphasis on the development of new solutions and courses of action required to cope with nonmilitary preparedness problems such as radiological defense, emergency resource control systems, and civilian survival standards.

(a) Program development and evaluation

Inadequate overall program development and evaluation stem from several identifiable causes: (1) The complexity of the programming job, (2) the existence of two, often competing, agencies, FCDA and ODM, and (3) the lack of a full-time program staff divorced from day-to-day concern with specific program areas.

In an effort to cope with the overall nonmilitary preparedness program job more effectively, we recommend establishment within the Office of Civilian Mobilization of a strong, central program development and analysis staff with the following functions:

1. Develop overall planning assumptions, based on enemy capabilities and weapons effect data for various emergency situations such as limited war, world war without nuclear attack, and world war with nuclear attack.

2. Assist Federal departments and agencies, in cooperation with other elements of the Office of Civilian Mobilization, prepare planning assumptions in such specialized areas as health services and food.

3. Identify, and evaluate the emergency plans, readiness policies and programs that are required in the nonmilitary defense field and recommend to the Director assignments of responsibility, both within the Office of Civilian Mobilization, among Federal, State, and local units of government, and to private groups and organizations.

4. Serve as the Director's principal adviser on coordination of the nonmilitary defense program both within and outside the Office of Civilian Mobilization to assure that related readiness actions are coordinated (e. g., food stockpiling with protective shelter) and that emergency plans reflect the status of readiness programs.

5. Evaluate, continually, the nonmilitary defense program and prepare status reports for the Director's use, including the overall evaluation of any test exercises that may be conducted.

6. Serve as the Director's principal adviser on policy analysis, review, formulation and revision, including evaluation of alternate policies and programs recommended by other elements of the Office of Civilian Mobilization, Federal departments and agencies, private groups, and State and local officials.

7. Represent the Office of Civilian Mobilization on the National Security Council planning staff.

8. Coordinate, through the State Department, the United States nonmilitary defense program with related programs of United States allies and such regional defense organizations as the North Atlantic Treaty Organization.

(b) *Research coordination and administration*

In our judgment, too much attention has been focused on applying historical solutions to nonmilitary preparedness problems, particularly World War II and Korea solutions. The approaches to nonmilitary preparedness problems have lagged dangerously behind the rapidly changing technology of warfare. In an attempt to overcome this deficiency, we recommend that the Office of Civilian Mobilization establish a central research staff which would be assigned the following functions.⁶⁴

1. Identify nonmilitary defense problems that require additional research and encourage, stimulate, and coordinate the development of an overall nonmilitary defense research and development program, including priorities for expenditure of funds.
2. Identify research conducted by public and private organizations which has a relationship to nonmilitary defense problems—Atomic Energy Commission, Department of Defense, National Academy of Sciences, and the like.
3. Coordinate existing research and development programs to prevent duplication and to assure effective use of the results from current and previous research projects, including maintenance of a central technical reference service.
4. Work with public and private agencies to extend present research and development efforts to encompass specific nonmilitary defense problems.
5. Coordinate nuclear testing requirements of nonmilitary defense research programs and evaluate and disseminate results of the tests.
6. Administer research contracts in those areas where it is not feasible to assign a given area of research to an existing department or agency. This would include such areas as radiological defense, protective shelter, damage assessment systems, civilian survival standards, emergency management of resources, and disaster operating doctrine.

SOME OTHER CONSIDERATIONS

In the course of our study we considered four questions related to the internal organization of the proposed Office of Civilian Mobilization. They are: (1) Is there need for an overall interagency advisory committee? (2) Is there need for a citizens' committee to advise the Director? (3) Should this Office be represented on the National Security Council? and (4) Where should the headquarters of the Office of Civilian Mobilization be located?

In subsequent paragraphs we will summarize the results of our study on each of these questions.

(a) *Providing for an interagency advisory committee*

At present both ODM and FCDA make use of top level interagency advisory committees—the Defense Mobilization Board in the case of ODM and the Civil Defense Coordinating Board in the case of FCDA.⁶⁵

We recommend that these two Boards be replaced by a single interagency advisory board.

Due to the heavy reliance on the established Federal departments and agencies to carry out many nonmilitary defense functions and activities, the continuance of some type of top-level interagency advisory board is necessary. Properly utilized it can serve as a vital part of the interagency coordinating and directing machinery which the new Office of Civilian Mobilization will require. This recommendation should not be interpreted as precluding the establishment of such lower level interagency committees as the Director feels are necessary.

(b) *Providing a formal channel for public advice*

Both ODM and FCDA have public advisory committees. Executive Order No. 10224 of 1951 established the National Advisory Board on Mobilization Policy and made the Director of ODM the Chairman. The members of this Committee, 16 in addition to the Chairman, are appointed by the President. The Federal

⁶⁴ The Federal Civil Defense Administration recently established a research and development organization under an Assistant Administrator.

⁶⁵ The Defense Mobilization Board was created by Executive Order 10200 and restated in sec. 102 (a) of Executive Order 10480; the Civil Defense Coordinating Board was established by Executive Order 10611.

Civil Defense Act established a Civil Defense Advisory Council composed of 12 members in addition to the Administrator of FCDA who is the Chairman of the Council. The members of the Council are appointed by the President.

In view of the present and potential ramifications of the nonmilitary defense job in almost every facet of life, the Director of the proposed Office of Civilian Mobilization should be provided with a mechanism for obtaining the advice and experience of outstanding figures who represent the general public interest. As recommended in our memorandum on field organization, there should also be public advisory councils in each of the eight regional offices of the Office of Civilian Mobilization.⁶⁶

(c) Representation on the National Security Council

Directly related to the functions of interagency relationships is the question: Should the Director of the proposed Office of Civilian Mobilization be a member of the National Security Council? The Director of ODM is now a statutory member of the Council. The Administrator of the FCDA attends meetings at which civil defense matters are considered, by invitation.

The established practices plus the nature of the nonmilitary defense job, as described in our previous four memorandums, make it clearly evident that the Director of the new Office of Civilian Mobilization should be a statutory member of the National Security Council.

(d) Physical location of the Office of Civilian Mobilization

The Office of Defense Mobilization is physically located in the Executive Office and an adjacent building in Washington. FCDA has, for all practical purposes, two headquarters units—a small one in Washington, D. C., and a larger one in Battle Creek, Mich.

To direct and coordinate effectively the efforts of other Federal departments and agencies, it is necessary that the proposed Office of Civilian Mobilization have its offices in the District of Columbia or its environs and be symbolically identified with the Executive Office of the President. This will mean moving certain elements of the FCDA national headquarters in Battle Creek back to Washington, but not all of them. In our view, the Battle Creek facilities make an ideal location for a national nonmilitary defense training center. We would propose leaving almost all public information and education and training activities at Battle Creek. In addition, it may be feasible to continue the nonmilitary defense research and development activity at Battle Creek.

IMPLEMENTING STEPS

In addition to the implementation steps outlined on page 453 of our memorandum entitled "Improving Organization for Executive Leadership of Nonmilitary Defense Preparedness," the following major steps should be taken in establishing the Office of Civilian Mobilization:

1. Abolish the present positions of Federal Civil Defense Administrator and Deputy Administrator created by Public Law 920 and of the Director of the Office of Defense Mobilization and the Deputy Director of the Office of Defense Mobilization created by Reorganization Plan 3 of 1953. The reorganization plan creating the Office of Civilian Mobilization should provide for the positions of Director and Deputy Director who should perform such functions as the Director may designate. In addition, the Director should be provided with a sufficient number of high-level aids to assist him in directing and coordinating the work of the Office. Salaries for the new statutory positions should be similar to those of comparable officials of the executive branch and the incumbents should be appointed by the President, by and with the advice and consent of the Senate.

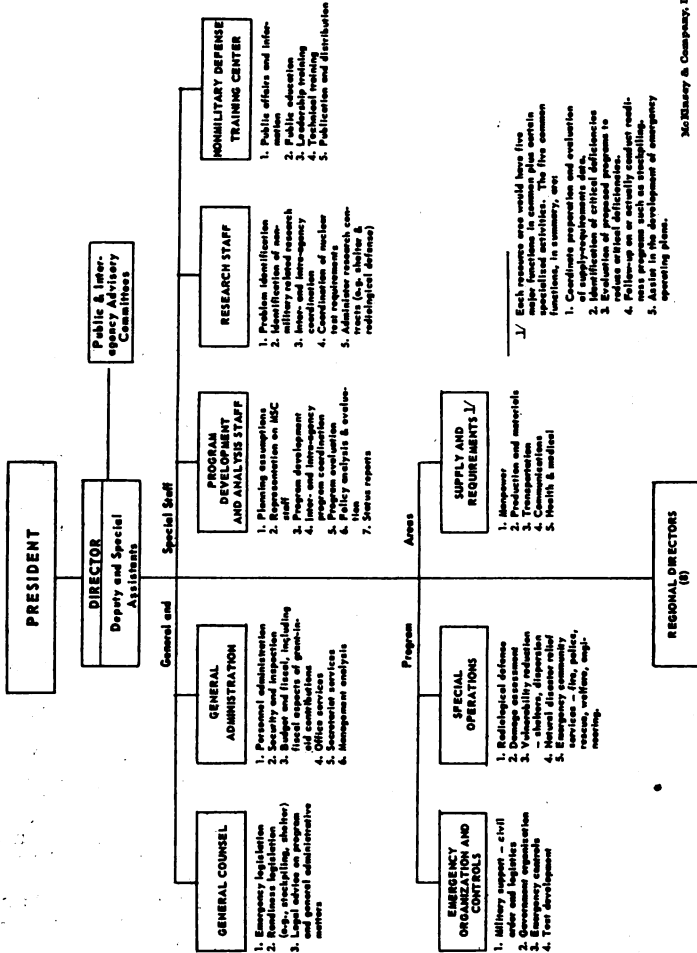
2. Transfer the Civil Defense Advisory Council, together with its functions, to the Office of Civilian Mobilization and provide for the establishment of a new interagency board to take the place of the Defense Mobilization Board and the Civil Defense Coordinating Board. These latter two Boards, together with the National Advisory Board on Mobilization Policy, should be abolished.

3. Make the Director of the Office of Civilian Mobilization a statutory member of the National Security Council.

⁶⁶ See p. 464 of the fourth memorandum in this series entitled "Tasks and Organization in the Field in Building Nonmilitary Defense Preparedness."

EXHIBIT I

ALTERNATIVE A - Internal Organization Structure of Proposed Office of Civilian Mobilization



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EXHIBIT II

ALTERNATIVE B - Internal Organization of Proposed Office of Civilian Mobilization

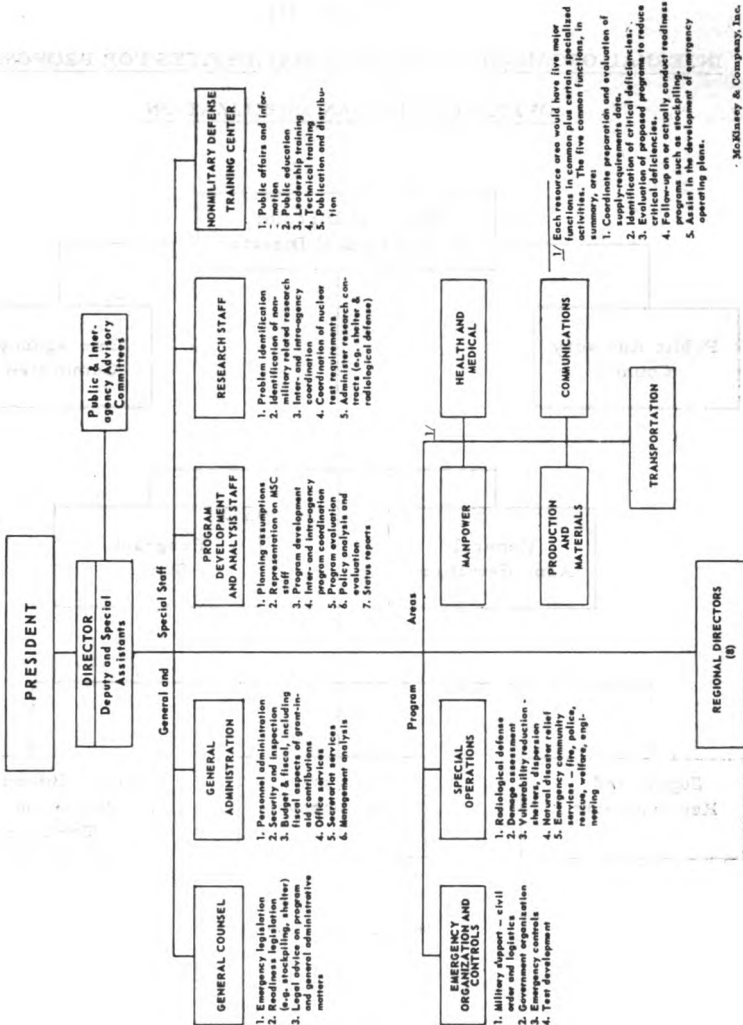
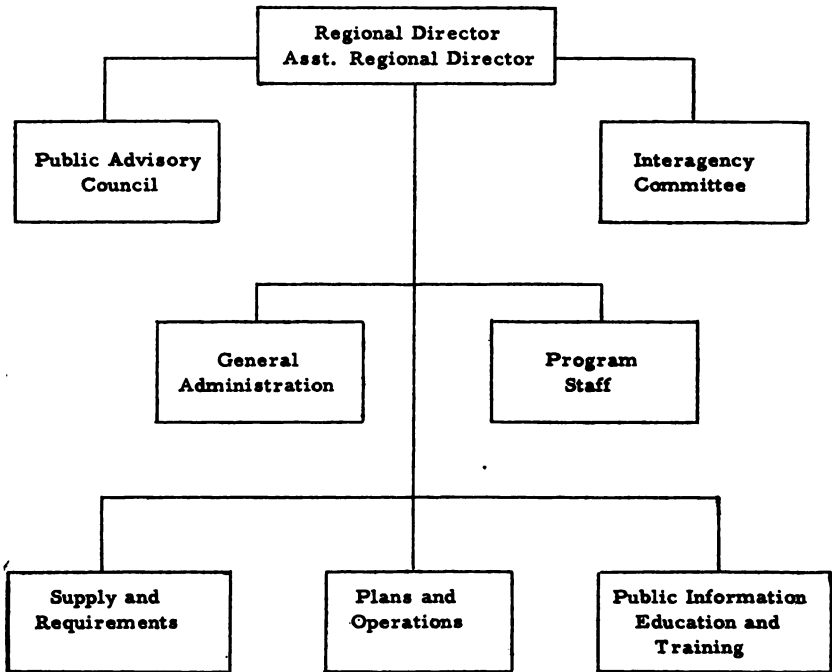


EXHIBIT III

INTERNAL ORGANIZATION OF REGIONAL OFFICES FOR PROPOSED
OFFICE OF CIVILIAN MOBILIZATION



McKinsey & Company, Inc.

EXHIBIT B—RAND CORP. STUDY OF NONMILITARY DEFENSE

(The following report, submitted by the Rand Corp., is an advance copy subject to possible revision prior to final publication by the Rand Corp.)

REPORT ON A STUDY OF NONMILITARY DEFENSE

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Preface.

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- II. Population shelters.
 - A. Types of shelters.
 - B. Warning and movement.
 - C. Performance of possible shelter systems under hypothetical attacks.
- III. Long-term fallout.
 - A. Medical consequences of radiation.
 - B. Long-term fallout levels after hypothetical attacks.
- IV. Recuperation of the economy.
 - A. Reorganization problems.
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 - C. Recuperation after a 50-city attack.
 - D. Heavier attacks and industrial shelters.
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- V. Some possible nonmilitary defense programs.
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 - C. Prompt consideration of long-term measures.

PREFACE

The study of nonmilitary defense described in this report¹ has been supported by the Rand Corp. as part of its program of Rand-sponsored research. In addition to its work for the United States Air Force and other Government agencies, the corporation regularly sponsors with its own funds research projects in areas of importance to national security and public welfare. Rand-sponsored research is considered to be fundamentally the responsibility of the individuals involved in the project, and the conclusions of such projects are not necessarily endorsed by the corporation. Such studies are published in the hope that they may contribute to wider understanding of important national problems.

This study of nonmilitary defense was initiated, directed, and formulated in its central features by Herman Kahn. Particular parts of the study were the responsibility of the following individuals, approximately in the order the subjects are mentioned in this report: Leon Gouré, foreign policy implications; Irwin Mann, improvised fallout shelters and other inexpensive measures; Robert Panero (from the staff of Guy B. Panero Engineers), mines and deep rock shelters; John O'Sullivan, conventional shelters and costs of complete shelter systems; Fred Iklé, strategic evacuation and social problems; Frank Ross, tactical evacuation; Leonard Berkovitz, performance of shelter systems under hypothetical attacks; Harold Mitchell, medical effects of radiation; Jerald Hill, long-time fallout problems; Joseph Carrier, food and agriculture; Paul Clark, economic recuperation after a 50-city attack; Norman Hanunian, heavier attacks and industrial shelters; George Reinhardt, "starter set" and recuperation interactions with active offense; Philip Dadant, interactions with active defense; Richard Moorsteen, Soviet nonmilitary defense capabilities. This summary report was drafted by Paul Clark.

¹This is an advance copy of the report, and further changes may be made in final editing.

A number of people in Government agencies have been helpful in furnishing information and orientation. While it would be impossible to list them all, the assistance of the following should be acknowledged: Federal Civil Defense Administration: John Devaney, Gerald Gallagher, Jack Greene, Ralph Spears, Benjamin Taylor. Federal Reserve Board: Roland Robinson. Naval Radiological Defense Laboratory: Walmer Strobe, Paul Tompkins. Office of Defense Mobilization: Joseph Coker, Harold Huglin, Burke Horton, Vincent Rock, Charles Sullavan. Science Advisory Committee: Spurgeon Keeney. Of course, none of the above are responsible for any portion of the study.

This report is unclassified, and no part of it depends on the use of classified information. In particular, the hypothetical attacks considered in evaluating various nonmilitary defense measures should not be construed as statements of enemy offense capability or United States defense capability. They are simply hypotheses about threats which appear conceivable sometime in the future and which provide a measure of the possible role of nonmilitary defense systems. Moreover, this report has been written as a summary statement for general distribution; technical aspects of the study are not presented in full detail.

REPORT ON A STUDY OF NONMILITARY DEFENSE

I. INTRODUCTION: INITIAL PREMISES

This study was initiated in the belief that nonmilitary defense measures, if they could be made effective in protecting the civilian population, economy and institutions of the United States, might make two significant contributions to the national defense. First, they might alleviate the catastrophe of a nuclear attack, and if military victory were attained, provide a reasonable chance that the United States as a nation could survive. Second, they might increase United States freedom of action in conducting peacetime foreign policy and implementing a broad deterrence strategy.

Alleviating the consequences of a nuclear war is an important objective in its own right. Even if a plausible attack a few years from now killed as many as 90 million Americans, it would still leave 90 million alive. However terrible the prospect, it would be worth investigating whether there are measures which might raise the number of survivors from 90 to 120 or 150 million, and which might increase the likelihood that the survivors could in time restore the national economy and democratic institutions. The prospect is terrible enough to make the avoidance of general war—by deterrence or by any measures which might safely permit reduction in tension—the primary objective. However, general war may nonetheless occur and it would be irresponsible to throw up our hands about the postwar world.

Moreover, in the years ahead, willingness to make foreign policy decisions carrying a risk of war may be important to meet major Soviet challenges that would threaten United States security. The more effective the defense of civilian society, the easier it would be for United States leaders to take such decisions. Deterrence of extremely provocative enemy behavior other than a direct attack on the United States might thus be maintained as a credible national policy. If nonmilitary defense measures caused Soviet leaders to believe that aggressive moves would meet firm resistance, they would be less likely to take such provocative actions. Deterrence of aggressions against countries other than the United States might also be accomplished by strengthening United States capability to meet limited aggression in a limited way, and we believe it is important to do so. However, it is possible that some aggression may be hard to deter or meet except by a credible threat of all-out United States resistance. It is true that the likelihood of direct Soviet attack on the United States would be measurably increased, particularly in the case of an implicit or explicit United States threat. Moreover, the level of destruction if deterrence failed would still be a subject for grave consideration by United States leaders. But these difficulties seem inherent in a foreign policy prepared to meet the range of possible Soviet threats.

It should be recognized that all-out nuclear war could start in many ways, other than by a premeditated Soviet attack. A local war might become so invested with national interests and prestige that Soviet leaders, if faced with decisive defeat, would choose to counter with an all-out attack. This danger has probably increased because Khrushchev seems less cautious than Stalin, less secure in his grasp of power, yet freer to exercise his diplomacy on a global scale. War might occur because of miscalculation of United States intentions;

in a period of acute tension, verbal and even military indicators would be difficult to interpret, and the premium on a first strike might well tempt the U. S. S. R. to launch a preemptive attack. War might even begin by accident, triggered by a chance release of weapons, and carried on because both sides are poised in a high state of alert for quick and nearly automatic retaliation. Finally, as just mentioned, we cannot rule out the possibility that the United States, faced with a major Soviet challenge, might sometime find even the risk of devastation preferable to the consequences of accepting defeat.

It may also be noted that nonmilitary defense measures could be more effective if war began in one of these other ways. A key factor in determining their effectiveness would be the ability of United States military forces to stop Soviet air attacks fairly quickly. Control of the military situation could be more quickly seized if the Soviet attack failed to achieve surprise, or if it were poorly executed, or if the United States were compelled to launch an attack. Nonmilitary defense measures themselves would also work better with more warning, as more fully discussed later in this report. Such wars appear sufficiently probable to warrant careful investigation of the potentialities of nonmilitary defense in these cases, as well as in the event of a premeditated Soviet attack.

The dependence of the defense of civilian society upon the effectiveness of United States strategic offense and active defense capabilities should be stressed. Nonmilitary defense measures must be evaluated not only with respect to feasibility, but also in their interaction with other aspects of national defense. They should not carry such high economic costs that United States strategic offense, air defense, or local war forces would be dangerously weakened. Such an overall evaluation of the place of nonmilitary measures in the entire field of national defense has not been attempted in this study.

On the basis of such initial considerations, the premise on which this study was started is that we should at least examine the feasibility of nonmilitary defense measures in a nuclear war. Of course, after investigation we may conclude that defense of civilian society isn't practicable. The destructive power of a single nuclear weapon, the delivery capabilities of high-speed bombers and ballistic missiles, the seeming inability of any current or proposed air defense system to prevent the delivery by an intelligent attacker of at least a considerable number of nuclear weapons, the widespread vulnerability of cities, the slow reaction time of large civilian populations—all these factors may well mean that effective nonmilitary defense can't be obtained at an acceptable cost. But the issues seem so important that they should be seriously investigated.

This study is certainly not a definitive treatise on nonmilitary defense. Rather, the study was designed to provide an initial broad overview. It has seemed preferable to consider a large number of aspects of nonmilitary defense, and to examine their interrelations, rather than to go more deeply into a few questions. The work has been done on a part-time basis by a rather large number of people from different disciplines, and all of the different pieces do not fit perfectly together. The pieces also differ in the research upon which they are based: some involve quantitative calculations of the performance of possible nonmilitary defense systems, others involve technical innovations and surveys of technical possibilities, while still others are necessarily based primarily on reflection about nuclear war and national defense strategy. Questions of the psychological reaction of the American people to a nuclear war and its aftermath remain largely unanswered. However, in the view of participants in the project, the study as a whole does provide a comprehensive orientation to nonmilitary defense problems which is fundamentally sound.

II. POPULATION SHELTERS

The first big question which must be raised about nonmilitary defense is whether people can in fact be protected from modern nuclear weapons. Protection involves not only provision of shelters capable of withstanding blast and fallout effects, but also arrangements for getting people into the shelters in response to different kinds of warnings. It should be stated at the beginning that it is impossible to provide reliable protection for all the population, and that the fraction of the population effectively protected depends greatly on the essentially uncertain nature of the enemy attack. There appear to be a number of possibilities for protective systems, however, and under plausible assumptions about the enemy attack and the civilian response, significant—and in some cases dramatic—reductions in civilian casualties appear to be obtainable.

A. TYPES OF SHELTERS

Improvised fallout shelters, even if only capable of reducing radiation to one-twentieth or one-thirtieth of the radiation outside, could have a significant effect in reducing casualties among people outside the areas of blast damage. There seem to be many possibilities of identifying and preparing such shelters in existing buildings in small cities and towns. For example, a location in the center of the basement of a 40,000-square-foot building (a typical large office, store, or school building) may have an attenuation factor of about 80. Moreover, a foot of earth gives a reduction factor of about 30, and sandbags distributed in advance could be quickly filled and placed to provide this type of shielding. Even buildings whose structural characteristics provide smaller attenuation factors could be quite useful, with arrangements for washing down or sweeping the roofs and surrounding areas (exposure to carry out the decontamination being rationed among the shelter inhabitants).

An essential element in the use of such improvised fallout shelters would be radiation meters. The meters would indicate how long outside activity could continue until heavy fallout arrived, would guide immediate decontamination work, would show when it was safe to emerge from the shelters, and would continue to be needed in postwar reorganization. Two main types of meters are available—a dosimeter, which measures cumulative radiation exposure over an interval of time and might cost \$1 to \$5, depending on the model, and a dose-rate meter, which would be more convenient in some operations but might cost \$15 to \$20. Predistributing 1 dosimeter for every 5 persons in the country and 1 dose-rate meter for every 50 might thus cost \$150 million to \$250 million spread over several years.

An often-neglected possibility is the use of suitably located mines for both fallout and blast protection. Mines for low-priced ores, such as limestone, sandstone, rock salt, and gypsum, typically consist of a regular pattern of rooms with level floors and 10- to 12-foot ceilings, completely self-supporting and dry. An engineering calculation prepared as part of the study indicated that a limestone mine at West Winfield, Pa., could be prepared for emergency 7-day occupancy at a cost of \$25 to \$35 per person. Such a mine would be provided with water tanks, latrines, utilities, and some air-conditioning equipment, and would be stocked with a bedroll for each person, cold processed rations, and some medical supplies.

A wide range of shelter designs providing blast protection of 50 to 200 p. s. i. (pounds per square inch above normal atmospheric pressure) seem to be possible using conventional construction techniques—shallow underground location, reinforced concrete or corrugated steel material, and heavy airtight blast doors.

There are still technical engineering uncertainties about many aspects of these designs, but corrugated steel shelters buried fairly deep look promising and are much cheaper than reinforced concrete. There is also uncertainty about the number of square feet to be provided per person, ranging from the 5 square feet in European shelters for short-time occupancy, to the 20 square feet in the Manhattan design discussed below. However, a reasonable guess is that a bunkroom type of accommodation for 90-day occupancy could be provided for something in the order of \$300 to \$400 per person. Such "medium" shelters might be appropriate for suburban fringes of large cities and for small cities which are presumed to be lower priority enemy targets.

"Light" shelters, primarily for fallout protection, would of course be cheaper—perhaps \$150 per person. Constructed shelters should be designed to provide much greater attenuation of surrounding radiation than improvised shelters; fortunately, 3 feet of earth provides an attenuation factor of about 1,000. Moreover, most fallout shelters ought to be planned and placed deep enough so that they could later be made into blast shelters in the 20-100 p. s. i. range, primarily by adding better blast doors. With appropriate evacuation procedures, such "light" shelters in towns and rural areas might be used by more people than any other type.

Finally, deep rock shelters created by mining rather than construction techniques appear to be the most promising approach (where sound rock is available) for blast protection in the range of 500 to several thousand p. s. i. Such "heavy" shelters would be indicated if a serious attempt were made to provide protection, other than by evacuation, for residents of large cities. Shelters with lower levels of protection might become partially obsolete soon after they were built. An engineering calculation of a system of deep rock shelters under Manhattan Island

for 4 million people indicated a cost of \$500 to \$700 per person, depending largely on habitability standards. The shelters were to be excavated 800 feet below the surface, using conventional excavation and mining techniques. They were to be almost completely isolated from the surface, with air purified and enriched with oxygen as in a submarine, with water tapped from the Delaware aqueduct system of tunnels and treated (or in emergency drawn from internal storage), and with power provided from diesel generators vented to the surface but isolated from the shelters proper. Occupants would be assigned a berth in a large dormitory, would receive 2 cold meals and 1 hot meal per day, and would draw fresh clothing, take showers, and exercise on a rotational basis. Some 91 entries were planned and distributed according to population, so that every point in Manhattan was within 5 to 10 minutes' walking distance of an entry; elevator design characteristics currently employed in New York should permit about a fourth of the people in the buildings themselves to reach the street every 5 minutes. The entries were sloped tunnels, with 500 p. s. i. blast doors both at the top and at the bottom, and provision could be made to collapse any single tunnel if the upper door gave way.

The point of this quick survey of types of shelters is that the possibilities seem to be both more varied and more promising than has been generally realized. However, while several kinds of shelters could be built today, one of the conclusions of this study is that a great deal of research and development work should be carried through before trying to decide on final shelter designs. Further preparation could both improve performance and lower cost.

B. WARNING AND MOVEMENT

In order for people to get into the shelters, they need some warning plus an appropriate movement plan. It is convenient to distinguish three degrees of warning—measured in days, in hours, or in minutes. Correspondingly, three general kinds of movement are possible—strategic evacuation, tactical evacuation, and ducking into the nearest shelter entry.

Warning measured in terms of days is possible if a nuclear attack occurs as an extension of a local war, or after a period of severe international tension, or as a last-resort decision by the United States. In each case the warning does not consist in discovery of secret enemy intentions to attack, but in recognition that an attack has become more likely and that the vulnerability of the civilian population should be reduced. Strategic evacuation, i. e., movement of a significant fraction of the city population into emergency quarters in small towns and rural areas, would then be possible. Indeed, some movement out of large cities would doubtless occur spontaneously. The prime historical example is the evacuation of children and mothers from London and other English cities in 1939, which reduced London's population by 25 to 35 percent.

Warning measured in hours is crucially dependent upon the tactics chosen by the enemy. However, one sensible enemy plan would be to concentrate his first wave, largely ICBM's plus some submarines and long-range bombers, upon the retaliatory capacity of the Strategic Air Command, and to defer a general city attack for a following wave, largely of refueled medium bombers. Any cities spared on the first wave might possibly have several hours of warning. Initial investigation suggests that in most cities, particularly the medium and small cities most likely to survive the first wave, an organized tactical evacuation could be carried out within 3 to 6 hours. The objective would be to move the bulk of the city population out to a shelter belt extending 20 to 50 miles from the center; less warning or slower movement would simply reduce the fraction saved. The key organizational principles for such a movement appear to be preplanned, one-way routes, maximum loading of vehicles, and prior instruction to each vehicle owner (perhaps on his registration certificate). Provision of shelters in the peripheral belt—ranging from "medium" blast shelters to improvised fallout shelters according to location—would be important, however; otherwise, many evacuees might flee the city only to succumb to fallout.

Warning measured in terms of minutes is likely to be all that would be available for any cities which the enemy chose to attack in his first wave, or possibly with a following salvo of ICBM's. Even in this case it appears to be technically feasible, as suggested in the Manhattan calculation, to design "heavy" shelters into which the bulk of the population could conceivably duck in 30 to 60 minutes—or a smaller fraction, if less time were available. A dramatic and unequivocal

signal, such as exploding a small atomic weapon at a very high altitude over the city, would help to get people moving quickly. But given the slow reaction time of the civilian population, it seems inevitable that nonmilitary defense measures in cities with only minutes of warning would be much less effective than elsewhere.

It should also be stressed at this point that the tactics chosen by an attacker, and hence the amounts of warning available to various cities, are very much a function of the posture of the Strategic Air Command and the effectiveness of United States air defenses. Unless SAC is so sheltered and defended that an enemy would have to concentrate nearly all of his first strike on attempting to destroy SAC's capacity to retaliate, warning sufficient for tactical evacuation—or even for ducking into “heavy” shelters—might not be available for many cities. The interaction of civil defense with active offense and active defense is further discussed in section VI below.

Finally, it may be noted that in nontarget areas there would be 1 to 10 hours of delay between the explosion of bombs on targets and the arrival of airborne fallout. This would give time for moving to designated fallout shelters, strengthening them with sandbags or window closures, filling water tanks and packing in home stocks of foods, and billeting evacuees from the cities.

C. PERFORMANCE OF POSSIBLE SHELTER SYSTEMS UNDER HYPOTHETICAL ATTACKS

A rough measure of the possible effectiveness of certain shelter systems is provided by some casualty calculations made as part of the nonmilitary defense study. Two possible shelter systems were considered—a system of fallout shelters only (largely improvised in the next few years, supplemented with light constructed shelters by the midsixties), and a system of heavy, medium, and light shelters designed to provide both blast and fallout protection for the entire population (and available no earlier than the midsixties). For each system, the effect of prior strategic evacuation of 70 percent of the population in the large cities attacked was also examined.

Two hypothetical levels of enemy attack were considered, with variants to take account of the amounts of warning received by large cities. The first level was defined as the delivery on target of sufficient weapons to destroy all buildings in the 50 largest urbanized areas (many receiving several weapons) plus all the SAC bases. The list extended to cities the size of New Haven, Conn., with a population of about 250,000. (It should be stressed that this hypothetical attack was not based on an analysis of enemy capability in the light of United States defenses, but was adopted as a means of measuring the performance of possible shelter systems. Approximately the same level of attack was also considered in other parts of the overall study.) Calculated fatal casualties in the various cases hypothesized are summarized in table 1.

With no nonmilitary defense measures, a completely effective 50-city attack might be expected to cause 90 million deaths in the United States, i. e., half of a projected population of 180 million. With a system of fallout shelters, but an enemy tactic of hitting the cities on the first wave or soon thereafter, about 70 million deaths might result. With the same fallout protection, plus several hours' warning for the cities so that a substantial tactical evacuation could be carried out, the casualty figure might be reduced to 30 million. Finally, if the attack occurred after strategic evacuation, casualties might be held down to 5 to 25 million people, depending upon the amount of warning to the large cities.

The second level of attack was defined as the delivery on target of sufficient weapons to destroy all buildings in about 150 urbanized areas plus all the SAC bases. The list extended to cities like Asheville, N. C., with a population of about 60,000. This hypothetical attack was presumed to occur further in the future. Accordingly, it was further assumed that 10 of the largest 20 cities would be hit by ICBM's in the first wave, and that following ICBM's would make tactical evacuation in some of the other cities less effective than in the earlier calculation. On the other hand, the later time period also made a more complete blast-and-fallout shelter system at least conceivable.

TABLE 1.—Calculated performance of alternative shelter systems under various attacks

[Millions of United States fatal casualties out of 180 million population¹]

A. 50-CITY ATTACK

	30 to 60 minutes of warning	3 to 6 hours of warning
No nonmilitary defense measures.....	90	90
System of fallout shelters plus arrangements for tactical evacuation.....	70	30
Same, after strategic evacuation.....	25	5

B. 150-CITY ATTACK²

	30 to 60 minutes of warning	3 to 6 hours of warning
No nonmilitary defense measures.....	160	160
System of fallout shelters plus arrangements for tactical evacuation.....	85	60
Same, after strategic evacuation.....	40	25
System of blast and fallout shelters plus arrangements for rapid entry.....	25	25
Same, after strategic evacuation.....	5	5

¹ For comparability the same population was assumed for both attacks, even though the 150-city attack was presumed to occur further in the future.

² Includes 10 cities hit by ICBM's with no warning.

With no nonmilitary defense measures, a completely effective 150-city attack could result in 160 million deaths in the United States, i. e., almost 90 percent of the total population. With a system of fallout shelters, and given several hours' warning to carry out a partly disrupted tactical evacuation in all cities except those hit on the first wave, casualties might be reduced to 60 million. With a complete system of blast-and-fallout shelters, and even with only 30 to 60 minutes of warning, casualties might be held to 25 million. Less warning would, of course, raise the casualties with a system of fallout shelters only, while prior strategic evacuation would permit still lower casualties with either system.

A further word should be said about these hypothetical attacks. Even if an enemy had the initial capability to destroy completely 50 or 150 large cities, it is not certain that he would do so in actual war. Successful accomplishment of a large retaliatory strike by SAC, and effective operation of United States air defenses, might so reduce enemy forces that he would not be able to take out so many cities. Or the war might start in one of the less pre-meditated ways mentioned earlier, so that his strikes would be small and uncoordinated. Or he might not attempt such widespread destruction, since the military payoff from destroying cities is low, and since he might hope to use the threat of further destruction to reinforce a surrender demand.

On the other hand, even with the assumed shelter systems, heavier casualties and more extensive destruction are also conceivable. Unless United States active offenses and active defenses can gain control of the military situation after only a few exchanges, an enemy could by repeated strikes reach almost any levels of death and destruction he wishes. Even in his first strike, if an enemy—perhaps bemused by memories of World War II—allocated a larger part of his force to destroying cities rather than to attempting to prevent retaliation by SAC, he could raise casualties by reducing warning and hitting more cities.

These casualty calculations are far from definitive. In addition to the intrinsic uncertainty of the size of the enemy's attack and his tactics, the model used was simple and subject to error. But the major implications of the calculations are probably valid. A system of fallout shelters might save tens of millions of lives in either a 50-city or a 150-city attack. A complete system of blast-and-fallout shelters would, of course, be more effective, and in the case of a 150-city attack would probably be needed to hold casualties below a third of the population. Both systems are affected by the amount of warning available, and sufficient time for tactical evacuation is particularly important for effective use of the fallout shelters. Prior strategic evacuation, if this were possible, could make a large improvement in the performance of either system. Thus the effectiveness of nonmilitary defense systems varies greatly with circumstances, but the cases in which performance is promising seems sufficiently likely to warrant serious consideration.

III. LONG-TERM FALLOUT

The second major question which must be examined in connection with non-military defense is whether the population can survive the long-term radiation levels resulting from fallout. There would be little point in sheltering people from the instantaneous blast and short-run fallout effects of a nuclear attack if they emerged from the shelters into an atmosphere so radioactive that life could not be sustained in the longer run. Long-term radiation appears particularly threatening in the light of widespread current fears about the consequences of nuclear testing—which release only a fraction of the radioactive materials which would be released in an all-out nuclear war.

The criterion which we shall use here in examining the consequences of long-term fallout, however, is quite different from the criterion generally used in discussing nuclear tests. There the concern is commonly with keeping radiation levels low enough that the number of people who might be injured is small in a statistical sense; here the concern is with evaluating the extent of further biological damage, relative to the number of people who survive the immediate catastrophe of nuclear war. We are also interested in any measures which might reduce the long-term biological damage, even though considerable damage seems inevitable.

A. MEDICAL CONSEQUENCES OF RADIATION

Medical evidence on the ability of the human body to sustain instantaneous or short-term exposure to total body radiation is reasonably clear; something like 200 r. (roentgens) measures the onset of serious illness and death. Evidence about heavier doses is more ambiguous, but about 450 r. seems likely to cause 50 percent deaths, and perhaps 600 r. to cause virtually 100 percent fatalities. Holding the short-term exposure below 200 r. for a large part of the population is one of the essential functions of a system of population shelters.

The consequences of chronic lifetime exposure to radiation are not so clear. There is evidence, however, that long-term damage can be assessed largely in terms of decreased life span; increases in such specific diseases as leukemia are statistically less important than increases in death rates from all causes. Moreover, analysis and extrapolation of data on radiation damage to animals suggests that a reasonable though uncertain estimate of the extent of life shortening might be something like 7 years per 1,000 r. for children, and less for adults. (Observations on the life span of radiologists in comparison to other physicians less exposed to radiation indicate that the animal data are not optimistic.) General life shortening of this sort would be a real human tragedy, but would hardly threaten survival of the population; it may be noted that about 10 years have been added to the adult life span in the United States since 1900 (apart from reductions in infant mortality, which have added an additional 10 years to overall life expectancy).

Genetic effects of long-term radiation are even more difficult to estimate reliably, because the observed cases in existing studies of Hiroshima and Nagasaki survivors and of American radiologists are so few as to barely meet accepted standards of statistical significance. However, the following statements appear to be reasonable, though again uncertain. For each 50 r. exposure to one parent, there may be an increase of one in a thousand in the number of harmfully affected offspring due to dominant mutations. Recessive mutations would only rarely produce serious malformation in immediate offspring, and their effects in lowered fertility and vigor would be spread out over many subsequent generations. Again the total human cost over time would be great, but the medical problem in any one generation could be handled. At present about 4 percent of babies are still-born or die shortly after birth, 2 percent are malformed, and 2 percent develop troubles later which are based on hereditary defects. Thus 1,000 r. of long-term radiation to both parents might raise the chance of producing a seriously defective child from 8 percent to perhaps 12 percent.

The medical consequences of internal deposition of strontium 90, cesium 137, and other radiation products taken into the body with food and water must also be considered. Strontium 90, which is chemically similar to calcium, is incorporated in the bone structure, and in sufficient high concentrations causes bone cancer, and possibly leukemia. Extrapolating from cases of radium-caused cancer, it appears that a concentration of strontium 90 between 10 and 100 microcuries is the range from a statistically significant rise in bone cancer to serious difficulty with large numbers of cancer cases. This range, while uncertain, is used in the fallout calculations in the next section; here it may be noted that at present in

the United States new bone is being laid down with a concentration of about 0.001 microcuries. The medical danger from cesium 137 appears to be less serious, since less of it is initially retained in the body and more is eliminated over time through replacement of muscle tissue. The medical danger from other isotopes deposited after a nuclear explosion needs further investigation, but present evidence indicates that strontium 90 and cesium 137 pose the most serious problems.

B. LONG-TERM FALLOUT LEVELS AFTER HYPOTHETICAL ATTACKS

The seriousness of the long-term radiation problem has been examined with the aid of 2 fallout calculations, based again on 2 hypothetical enemy attacks. The first attack, which corresponds approximately to the 50-city attack discussed previously, was defined as an attack which releases about 1,500 megatons of fission products. The second attack was based on the extreme hypothesis of 20,000 megatons of fission products. (Note that this attack is many times as heavy as the 150-city attack discussed above; we shall call it an area attack, because with appropriate enemy tactics its blast effects might be sufficient to destroy all structures in entire States or regions.) This area attack was assumed in order to examine long-term fallout problems far more serious than have generally been considered.

Before examining the results of the fallout calculations, let us note three characteristics of fallout which are important in interpreting the calculations. First, fallout would be quite unevenly distributed over the area of the United States, particularly after a 50-city attack. This raises the possibility of people living and raising food primarily in the less contaminated areas of the country. To point up this unevenness, the calculations specify average fallout levels (the total deposit divided by the United States area, 3 million square miles), maximum fallout levels (based on a geographical analysis of assumed targets, allowing for overlap of fallout patterns), and minimum fallout levels (based on the United States share of worldwide fallout resulting from equal attacks on the United States and the U. S. S. R.).

Second, fission products decay with the passage of time. The rate of decay is conventionally approximated with a formula involving the factor $t^{-1.2}$, which implies that the radiation rate a week after an attack would be 0.2 percent of the 1-hour rate, and after 90 days would be 0.01 percent. Actually roughness of the terrain and surface of the earth, weathering, and the fact that the formula is approximate mean that the decay would probably be 2 to 5 times greater than that. The calculations below are all standardized to refer to the period starting 90 days after the attack. It is, of course, recognized that fallout protection immediately after the attack must first be adequate to hold total radiation below 200 r. for the bulk of the population.

Third, countermeasures are possible to reduce the radiation which people receive. Decontamination, by washing or sweeping hard surfaces, and by plowing or scraping earth areas, can reduce residual radiation to levels one-fifth to one one-hundredth of those prevailing previously. Shielding buildings with earth or concrete can produce almost any attenuation desired; shielding to one-tenth or one one-hundredth of radiation levels outside is possible even on mobile equipment such as bulldozers. Once a few protected areas are available, radiation damage can be limited by rationing the number of hours within each day when individuals have to work in a contaminated environment. In the calculations below, it is assumed that all dose rates would be reduced to one one-hundredth of the level computed with the $t^{-1.2}$ formula—perhaps one-tenth for decontamination, times one-fifth for shielding and time rationing, times one-half for more rapid decay than in the $t^{-1.2}$ formula.

Countermeasures to reduce people's consumption of strontium 90 in food and water are also available. Among such measures are shifting part of agriculture to less contaminated land, decontamination of cropland by deep plowing or scraping, maximum use of crops like potatoes and wheat which have low concentrations of strontium 90 in their edible portions, reducing normal consumption of calcium and replacing it with calcium pills from uncontaminated mineral sources and, where necessary, removal of fission products from drinking water by filtration or precipitation. Other possible countermeasures may be developed by research, including chemical treatment of soils to leach out strontium 90 or limit its absorption by crops, development of food processing methods which reduce the content of fission products, and discovery of medicines which limit retention of strontium 90 by people and animals. No quantitative allowance for

these specific countermeasures against strontium 90 has been made in the calculations below.

The fallout calculations are summarized in table 2. In the case of a 50-city attack, the cumulative lifetime exposure (after 90 days, with countermeasures) to total radiation, averaged over the area of the United States, might be less than 5 r. The maximum in some areas might be about 75 r., but a map study indicates that more than 85 percent of United States land area would receive less than the average contamination. Thus if short-term radiation could be held below 200 r. for the bulk of the population, the additional long-term problem would be comparatively small. The general shortening of lives and genetic consequences resulting from short-term and long-term radiation combined would apparently be below the range discussed in the previous section.

TABLE 2.—*Estimated long-term radiation after various attacks*

A. 1,500 MEGATONS OF FISSION PRODUCTS (50-CITY ATTACK)

	Average	Maximum	Minimum
Total fallout (kilotons per square mile).....	0.4	8.3	0.003
Radiation rate after 90 days with countermeasures ¹ (milliroentgens per hour).....	.46	10.0	.0035
Cumulative lifetime exposure ¹ (roentgens).....	3.4	73.0	.026
Strontium 90 fallout (curies per square mile).....	40.0	830.0	.3
Cumulative lifetime concentration in bone without countermeasures (microcuries).....	2.0	42.0	.015

B. 20,000 MEGATONS OF FISSION PRODUCTS (AREA ATTACK)

	Average	Maximum	Minimum
Total fallout (kilotons per square mile).....	5.3	36.0	0.04
Radiation rate after 90 days with countermeasures ¹ (milliroentgens per hour).....	6.5	43.0	.049
Cumulative lifetime exposure ¹ (roentgens).....	48.0	310.0	.36
Strontium 90 fallout (curies per square mile).....	530.0	3,600.0	4.0
Cumulative lifetime concentration in bone without countermeasures (microcuries).....	26.0	180.0	.2

¹ Assumes that radiation rates are reduced to 1/100 of the level computed with the $t^{-1.2}$ formula, because of decontamination, shielding and time rationing, and inaccuracy in the formula.

As to strontium 90, the estimated long-term accumulation resulting from a 50-city attack, averaged over the entire United States, is 2 microcuries. (Note that the average is more representative for strontium 90 than for total radiation, since it enters the body in food presumably grown in all parts of the country. However, the relation between total fallout and ultimate medical exposure is also more uncertain for strontium 90.) This is below the range discussed in the previous section, so it seems likely that strontium 90 would not create a critical public health problem, even without countermeasures.

In the case of the extremely heavy hypothetical area attack, the cumulative exposure to total radiation, averaged over the entire United States, might be about 50 r. The maximum figure might be about 300 r., however, and possibly less than half of the United States land area would have less than the average contamination. Thus more extensive radiation control measures over a longer period of time would be indicated. But even in this case the medical and genetic effects of the combined short-term and long-term radiation would apparently be below the range examined earlier.

As to strontium 90, the long-term accumulation after an area attack has been estimated at about 26 microcuries, on the average, for the United States. This is within the range from statistically significant rise in bone cancer to generation of widespread cancer in the population. In this case, therefore, extensive and continuing countermeasures against strontium 90 would almost surely be needed. Fortunately accumulation of strontium 90 in the body is a lifetime process, so there would be time to make such countermeasures effective.

To conclude: despite many unresolved questions about long-term fallout, it seems to be a sound generalization that long-term radiation problems are a less critical threat to the survival of a population than the central short-term problem—how to protect a substantial fraction of the population from the immediate disaster of a nuclear war.

IV. RECUPERATION OF THE ECONOMY

The third basic question which must be weighed in considering nonmilitary defense is whether a viable economy could be reconstructed after a nuclear war. If a large fraction of the population could be sheltered from the immediate attack, and if they could survive the long-term radiation which followed, could they also go on to support themselves and to restore a reasonable standard of living in less than a generation? We are of course also interested in noting any promising preattack or postattack policies which might facilitate economic recuperation.

A. REORGANIZATION PROBLEMS

The initial phase of economic activity following a nuclear attack would be dominated by reorganization problems, so that any resources which survived the attack could again be effectively used. These reorganization problems have been a major concern of existing Government agencies in the nonmilitary defense field, and little further effort was devoted to them in this study. Some of the problems are physical—patching up capital which has suffered only partial damage (e. g., electric power grids, open-hearth furnaces without chimneys), decontamination of factories immobilized by fallout, even disposing of the millions of dead. Other pressing problems are institutional—preservation of the government framework, restoration of a monetary system and of decision-making authority in business enterprises, reestablishment of markets for consumer goods and raw materials (though doubtless controlled in certain respects), and activation of the labor force so that people support themselves by regular work (often in new occupations). In all these instances prior planning, based on a realistic appraisal of the postattack situation, seems to be the essential approach. For example, prior stocking of radiation meters would be critically important for decontamination.

Given reasonable preattack preparations, these reorganization problems do not appear insuperable. In particular, we should not underestimate the strength in an emergency of a decentralized private enterprise economy and of widespread ingenuity among the people. Accordingly, in the following analysis it has been assumed that extensive reorganization could be accomplished within perhaps 6 months, so that any economic resources which survived could be effectively used thereafter.

B. FOOD

During the reorganization phase, the bulk of the food and other consumer goods needed to sustain life would have to come from inventories or from imports rather than from domestic production. A thorough investigation of the normal geographical location of such inventories, and of the relation of probable surviving inventories to truly minimal needs of the population, is a bigger research job than could be done in this study. However, a rough estimate indicates that surviving food inventories, after either a 50-city or a 150-city attack, would be sufficient at least for survival. The Government now has a large store of agricultural products accumulated in price-support operations; stocks of wheat, corn, and other grains on September 30, 1957, were sufficient to supply 2,000 calories per day to 180 million people for more than 1 year. These Government stocks are dispersed so as to be largely invulnerable to a city attack, they (as well as crops close to harvesting) are not made unfit for human consumption by fallout, and after some milling any grain is suitable for human consumption as an emergency diet. There are substantial further stocks in private hands. Emergency grain imports from Australia, Argentina, and other producing countries are also an important possibility.

The cost of 3 months' shelter rations for the entire population has been looked into to some extent. Minimum nutritional needs could probably be met by a source of calories (wheat flour and sugar being cheapest), a source of protein (such as soy grits), and supplementary minerals and synthetic vitamins. The cost of 2,000 calories of this minimum diet at wholesale prices would be something like 15 cents per person per day. Allowing for a somewhat more palatable food-mix and for packaging, a conceivable total cost figure might be 40 cents per person per day. Thus 3 months' rations for 180 million people might be expected to cost \$6 billion to \$7 billion initially, plus some recurring storage and deterioration costs. Such a stockpile of rations would be an essential element of a complete system of blast-and-fallout shelters in which the population might live for several months, and is an important subject for further research.

Turning to the production of food after the reorganization phase, it is reasonably clear that a 50-city attack would not be a serious threat to the recuperation of United States agriculture. At present, 320 million to 340 million acres of cropland are harvested annually. But only about 20 percent are used to produce food directly for human use, with the balance producing livestock feed and industrial crops. Moreover, the Department of Agriculture estimates that there are about 200 million acres now in pasture, range, and woodland which could be improved and planted to crops. Given the contamination levels after a 50-city attack as discussed earlier, adjustments of cropping patterns and land use should be sufficient to permit safe recuperation of agricultural output to preattack levels. The conclusion ought to be similar for a 150-city attack.

In the case of the hypothetical area attack discussed earlier, with 20,000 megatons of fission products, contamination of half or more of the area of the United States with dangerous concentrations of strontium 90 would present serious agricultural problems. Even here, countermeasures designed to hold the accumulation of strontium 90 in the general population below the threshold to widespread cancer generation appear to be available. It would also be possible, in an attempt to insure against agricultural failure, to accumulate a special stockpile of unprocessed foodstuffs sufficient for a year or two at a minimum subsistence level. The Government stocks of grain cited above, for example, were valued at about \$4 billion.

C. RECUPERATION AFTER A 50-CITY ATTACK

More vulnerable than agriculture to nuclear attack is a nation's industry. Industrial buildings and equipment are even more concentrated in large cities than population; the 50 largest metropolitan areas contain about a third of United States population but more than half of United States manufacturing capital. Thus it is not unreasonable to fear that (even if reorganization problems were surmounted) destruction of the Nation's capital might be so severe, and surviving capital might be so out of balance among industries, as to keep industrial production below levels adequate for recuperation.

As part of the overall nonmilitary defense study, therefore, a rough quantitative analysis of the status of the economy soon after a completely effective 50-city attack, and then a decade later, was undertaken. The basis for the analysis was a table showing the 1952 relationship between national capital (about \$830 billion) and the gross national product (about \$340 billion). Capital and GNP were connected by way of nine producing sectors, each of which used part of the national capital plus current inputs from other sectors, and produced current inputs to other sectors plus finished products which make up the GNP. This table was used to make two main calculations.

TABLE 3.—Possible recuperation of gross national product after 50-city attack
[Percentage of preattack]

	1st year after reorganization	11th year after reorganization	
		Consumption policy	Investment policy
GNP.....	56	89	128
Consumption.....	58	103	137
Food.....	77	100	124
Housing.....	60	95	133
Nondurables.....	51	113	135
Durables (new).....	0	86	216
Government.....	54	72	86
Investment.....	48	48	150

¹ 6th year: 202.

First, what could be produced with the surviving capital outside the 50 destroyed metropolitan areas in the first year after reorganization? Here it was assumed that in each sector output would be reduced in the same proportion as its capital—i. e., to 30 to 60 percent of preattack, depending on the sector. The finished products available as contributions to postattack GNP, taking account of necessary current inputs to other sectors, could thus be calculated. The results

are set forth in table 3. In the first year after reorganization, it appears that surviving capital would permit a GNP between 50 and 60 percent of preattack, with consumption a little higher, investment a little lower. On a per capita basis (if as many as 85 percent of the population should survive), this is about the same as 1929 or 1940. Also on a per capita basis, the availability of broad categories of consumption goods—food, housing, and nondurables—seems to be sustainable. The one major bottleneck which is indicated is in the capacity of the economy to produce new durable goods (metals, building materials, and machinery). The calculation suggests that in order to restore production of new industrial machinery to only a quarter of its preattack level, it would be necessary to stop entirely production of new consumer durables and to reduce production of new military equipment sharply to a maintenance level.

The second calculation examined the possible reconstruction of capital and expansion of GNP over the following decade. Here it was assumed that each sector could expand its output only in the same proportion as its capital was rebuilt. The total rebuilding of capital in the entire economy was limited by the cumulative output of the two sectors, durable goods and construction, which produce new equipment and buildings. Two policy variants were also considered. Under the consumption-oriented policy, investment was held at the postattack level throughout the decade, and as new capital became available it was devoted to producing an immediate increase in consumption. Under the investment-oriented policy, consumption was held constant for 5 years, while the capital-producing sectors were expanded, and then a much larger volume of investment in the last 5 years was directed to a more rapid improvement in consumption. Under either policy the calculation suggests that the status of the economy after a decade of reconstruction could be more favorable than has been feared. A consumption-oriented policy might permit a GNP about 90 percent of preattack, while the more ambitious investment-oriented policy might attain 125 percent. Thus restoration of preattack GNP within something like a decade seems a reasonable estimate.

It is apparent that these calculations are rough. There undoubtedly would be narrower bottlenecks within the broad sectors analyzed here. Yet in view of such experiences as the handling of the rubber crisis in World War II, it is hard to believe that these would be disabling; fairly small stockpiles of materials and products needed to overcome narrow bottlenecks are also possible. Serious attention would have to be paid to possibilities of raising production through more intensive use of capital (e. g., by multiple shifting), to economizing on capital costs of rebuilding plants in the postattack environment (e. g., by temporary structures), and to postponing retirement of old plants and equipment during the reconstruction effort. On balance, however, there is probably as much ingenuity and flexibility in the real world as in this analysis.

This general picture of recuperation after a 50-city attack has certain implications for preattack nonmilitary defense policy. Three main kinds of action can be listed in what seems a sensible order of priority. First, stockpile construction materials for patching up partially damaged capital during the reorganization phase. Clearly the payoff from such emergency repairs would be great. Research into likely patterns of partial damage in key industries, and into economical ways of patching them up in the postattack environment, is needed. An interesting idea is to stockpile connectors, like nails, rivets, and welding rods, for use with salvaged materials. Second, preserve normal inventories of metals, building materials, and machinery. Capital in these industries was the major bottleneck revealed in the calculations described here. Research into the amount and kinds of payments needed to persuade private firms to bear the added cost of sheltering their normal inventories is needed. In the case of machinery, obsolete equipment would be cheap today, but valuable after an attack. Third, shelter complete plants in the durable-goods sector of the economy, or possibly standby components of plants. Again, research into the added costs of underground operations in key industries is needed, as further discussed in section D below.

D. HEAVIER ATTACKS AND INDUSTRIAL SHELTERS

Heavier attacks would of course further reduce the industrial capital which might survive for postwar use, and would increase the danger that narrow bottlenecks might limit effective utilization of what survives. A 150-city attack would raise the level of destruction from about 55 percent of United States manufacturing capital to around 70 percent. And an area attack, which might conceivably collapse all structures in the 11 most important industrial States of the

Northeast plus all the remaining metropolitan areas in other States, could destroy nearly 85 percent. Though part of United States capital would survive even the hypothetical area attack, it seems clear that some means of preserving a larger fraction would be needed to face postwar recuperation with any real hope.

Blast shelters should be able to provide such protection for industrial capital just as for population. There are differences in the technical problems to be faced; for example, industrial plants which release much heat would require additional cooling equipment, and those with a large volume of material inputs and product outputs would require larger entries and more transport equipment. But there seems little question that either conventionally constructed "medium" shelters or excavated deep rock "heavy" shelters could be designed and built for industrial capital.

Some illustrative examples of the possible costs of such underground construction are also available. The Army engineers have published engineering estimates of the comparative costs of reproducing three specific plants on the surface and in existing mines. A chemical processing plant was estimated to cost about twice as much underground, a precision manufacturing plant about a third more, and a warehouse actually 15 percent less. These costs were for reproducing an identical surface plant underground; further engineering estimates prepared as part of the current study, in which plant designs were adapted to the special characteristics of mine space, indicated that costs could be lower (and perhaps even below those on the surface) for all three types of plant. It should be noted, however, that initial plant construction costs, when placed on an annual basis, are only a small fraction of total annual costs; for example, perhaps a tenth as large as labor costs in manufacturing. This suggests, on the one hand, that a manufacturer might absorb substantially higher construction costs considered by themselves, but on the other hand, that incidental effects of underground plants on location costs and labor costs could be a more serious obstacle. Further research into the economical design of plants in many industries for underground operations, and into methods needed to induce private firms to accept such locations, is indicated.

If a broad program of underground industrial plant construction were embarked on in the United States, an important characteristic of the program is that it could be limited to a fraction of total industrial capital. Some capital could be expected to survive because of its normal geographical dispersal, and if the analysis in section C is reasonably reliable, survival of something like half of total capital might permit a respectable recuperation. A crude estimate of the total cost of sheltering about a fifth of manufacturing capital by 1970 was prepared as part of the study, using the published cost differentials cited above, and allowing for different degrees of normal dispersal among some 20 manufacturing industries. Such a program, which might leave the economy somewhat better off after a 150-city attack than with no industrial shelters after a 50-city attack, was calculated to cost in the order of \$30 billion, though the figure is surrounded with great uncertainty.

E. MINES

Mines for the excavation of low-valued ores like limestone seem to have many possible uses in nonmilitary defense. We have already referred to adapting them for temporary population shelters, for warehouses (at costs competitive with surface warehouses), and for manufacturing plants. Combinations of these uses can be planned; for example, permanent underground industrial plants usable as temporary population shelters. Explicitly military functions are also possible; for example, control and communications centers in the air defense network. Accordingly, a quick survey of the availability of such mines was undertaken as part of the study.

A reasonable estimate is that the United States now has at least 750 million square feet of usable space in mines with suitable characteristics for industrial or population shelters. This is 10 to 15 percent of existing manufacturing floor-space; alternatively, at 20 square feet per person it could accommodate nearly a fourth of the United States population. Of course, part of this space is not conveniently located for use as industrial shelters, and the bulk of it would be usable as population shelters only if outfitted and in the event of strategic evacuation. But it seems reasonably clear that mine space is a major national asset, the possible uses of which have not been adequately explored.

In the longer run it ought to be possible to expand markedly the availability of such mine space at convenient locations. The bulk of low-valued ores currently being produced come from quarries. But firms with a mining operation sometimes compete in the same markets, and the choice between quarrying and tunneling is based on cost for the particular deposit being exploited. Payment of a premium for low-valued ores excavated from mines rather than quarries could over time stimulate considerable conversion of operations. Limestone, for example, is currently sold at prices in the neighborhood of a dollar per ton at the minehead, which is equivalent to about a dollar per square foot of mine space created. Thus a premium of as little as 50 cents per square foot could have a widespread effect on operations in the limestone industry. Premiums could also affect the location of mining operations, since there appear to be billions of square feet of readily excavatable rock formations (though at higher costs) suitably near or under many large United States cities.

V. SOME POSSIBLE NONMILITARY DEFENSE PROGRAMS

Our discussion of population shelters, long-term fallout, and economic recuperation suggests (despite the many uncertainties involved) that nonmilitary defense measures could significantly alleviate the catastrophe of a nuclear war. There appear to be technically promising possibilities for protecting many people from immediate blast and fallout, for enabling the population as a whole to carry on despite long-term radiation, and for restoring a reasonable standard of living within less than a generation. It is important to consider the costs of these technical possibilities, however, since today there are many strong claimants on the Government budget, and thus on the incomes of voters and taxpayers. It is especially important to consider a range of costs for alternative programs which attempt different levels of performance. Only rough cost estimates are possible with the imperfect information now available, but as part of the overall study an attempt was made to indicate their order of magnitude for several coherent programs.

A. EXISTING PROGRAMS AND ASSETS

In the last few years the United States Government has been spending between \$50 million and \$100 million a year on nonmilitary defense, apart from stockpiling. This figure is extremely small either in relation to the entire national-defense budget or in comparison to the costs of certain possible nonmilitary defense measures discussed above. However, a good deal could probably be done with expenditures as little as 2 to 3 times recent annual budgets, particularly by taking advantage of existing assets.

A nonmilitary defense program costing \$200 million to \$300 million could probably accomplish most by concentrating on a system of improvised fallout shelters outside the large cities. Major elements of such a program might be: Identification of existing buildings in small cities and towns which provide high attenuation factors against fallout; provision of sandbags, water tanks, and other minimal supplies needed to convert these buildings into operating fallout shelters for short-term occupancy; widespread distribution of radiation meters, as discussed earlier; preparations to take advantage of partial strategic evacuation, in case international tension should make it desirable; planning and practice of tactical evacuation of cities for which fallout accommodations are available in a belt 20 to 50 miles away from the center. None of these actions would be very expensive, and the resulting system might cover only part of the population, yet in appropriate circumstances they might save millions of lives. Once the Government embarked on such a program, helpful private actions would be more likely.

Existing government assets could also be adapted in certain respects to nonmilitary defense objectives. The Office of Defense Mobilization now has a strategic stockpile containing over \$6 billion of industrial raw materials, accumulated to support a war mobilization of several years. Modification of the stockpile with an eye to economic recuperation after a short nuclear war would be sensible. Further processing of part of the raw materials, so that they could be more quickly used amid the widespread destruction following a nuclear attack, might possibly be financed by gradual disposal of unprocessed materials. The Government also owns \$2 billion to \$4 billion of war reserve machine tools. These are largely stored at plants producing military equipment, to facilitate rapid expansion of output during a mobilization. Here a reasonable adaptation would probably be to store the tools either in shelters or in nontarget locations so that they

could be expected to survive a nuclear attack. Certainly such tools should not be disposed of, as has been considered, without evaluating their nonmilitary defense contribution. The Army, Navy, and Air Force have several billions of dollars of obsolete military stocks, ranging from generally useful items like clothing to specialized items like jet engines. These might be investigated to see how much could be useful for nonmilitary defense as well as military reserves. Finally, the Commodity Credit Corporation has \$7 billion to \$8 billion of agricultural products, accumulated in connection with the price-support program. Fortunately most of these holdings are already geographically dispersed, but some further improvements are perhaps possible.

B. TWO SCALES OF SHELTER PROGRAMS

The essential ingredient of nonmilitary defense programs which offer greater hope of alleviating nuclear disaster is a comprehensive and coordinated system of population shelters. There appears to be a wide range in the cost of such programs, however, depending on the degree of protection attempted for residents of large cities and the amount of associated preparation for postattack survival and recuperation. To illustrate the range of costs, two hypothetical programs are presented in table 4. These programs are comparable to the two systems whose performance was calculated in section II-C above.

TABLE 4.—Estimated initial costs of 2 possible nonmilitary defense programs

[Billions of dollars]

	A. System of fallout shelters plus limited economic support	B. System of blast and fallout shelters plus extensive economic support
Population shelters:		
"Heavy" blast shelters (500 p. s. i. and up, \$700 per person).....	0	28
"Medium" blast shelters (50 to 200 p. s. i., \$400 per person).....	0	20
"Light" fallout shelters (improvable later, \$150 per person).....	15.0	26
"Improvised" fallout shelters (\$10 per person?).....	1.0	0
Food rations and stockpile (rations, 40 cents per person per day).....	1.5	25
Nonfood stockpile.....	1.5	20
Industrial shelters.....	1.0	30
Total.....	20.0	149

Program A is designed to provide fallout protection only (requiring several hours of warning to save many people in the large cities), plus economic support appropriate for a 50-city attack. It includes no heavy or medium shelters, but light and improvised shelters (an equal number of each) are distributed to accommodate the entire population after strategic or tactical evacuation. It provides 30 days' special rations for about two-thirds of the shelter places, and presumes that people carry additional food into the shelters with them. The small nonfood stockpile concentrates on decontamination equipment and construction materials for patching up damaged capital. The industrial shelters represent largely the cost of inducing firms in durable goods industries to shelter their normal inventories.

Program B is designed to provide both blast and fallout protection with 30 to 60 minutes of warning, plus economic support appropriate for a 150-city or larger attack. It includes heavy and medium shelters for all residents of the 150 largest cities, as well as light shelters for the rest of the population, with extra spaces for evacuees from the large cities in case that proved feasible. It provides 90 days' special rations for each place in a shelter, plus \$15 billion for a bulk food stockpile. The substantial nonfood stockpile to facilitate economic recuperation includes much more decontamination equipment and construction materials, as well as selected parts for key industries, and the cost of increasing available mine space. Finally, program B provides industrial shelters for something like a fifth of preattack manufacturing capital.

Quite rough estimates of the costs of these two programs, as set forth in table 4, suggest that nonmilitary defense programs may range in cost from \$20 billion to \$150 billion (i. e., \$2 billion to \$15 billion a year over a decade),

depending on the scale which is attempted. These costs have been estimated without allowing for a tendency in many public construction projects to provide more luxurious accommodations, but on the other hand they represent programs which are coherent and complete. Intermediate programs at intermediate costs are also possible.

The desirability of adopting a nonmilitary defense program at any particular scale of cost can only be evaluated, of course, in a broader context. One element in the problem is the willingness of United States voters to support appropriations for all national-defense purposes combined. Another element is the estimated performance and cost of other kinds of national-defense expenditures: long-range retaliatory forces, facilities for active defense of the United States, and capabilities in limited wars overseas. No attempt has been made in this study to carry through such an overall examination of the national-defense problem. Costs of various possible nonmilitary defense measures should be considered in such an overall evaluation, however, and the rough estimates presented here may serve to guide more thorough investigation.

C. TIMING AND PHASING PROBLEMS

Any large new Government construction program normally takes years to put into effect, and a nonmilitary defense program near the more ambitious end of the cost scale might take especially long to implement because of the many new problems to be faced. Yet it is important, before carrying out any construction, to clarify the uncertainties which at present surround nonmilitary defense measures—both to provide a firmer basis for a policy decision as to the appropriate scale of effort, and to improve the performance or lower the cost of any measures which are chosen. Considerable thought has therefore been given to possible ways of clarifying these uncertainties without losing much time in the normal construction process.

The most promising approach appears to consist in prompt initiation of a broad research, development, and planning effort in the nonmilitary defense field. The design and planning of specific measures should be carried sufficiently far so that if it is later decided to undertake them, normal lead times could be significantly cut. Prompt investigation and decision would also permit measures which work gradually over time, such as premiums for the creation of suitably located mine space, to be useful.

Another approach, if a large-scale nonmilitary defense program should be decided upon, would be to create a temporary stockpile of materials needed in the construction of shelters. Such a "starter set," accumulated while legal and other arrangements were being made in localities throughout the country, would even out the impact of the program on the economy. More important, it might permit a program originally planned to take perhaps a decade to be markedly accelerated if international relations became unexpectedly tense. A crash program, akin to the expansion of military production in the Korean war, might be able to proceed without critical material shortages. There are also possibilities for combining such a "starter set" with the stockpiling of materials for post-attack recuperation.

There are also difficult problems of phasing a nonmilitary defense program. On the one hand, early capabilities are desirable. On the other hand, the enemy threat can be expected to continue to mount, both in terms of weapons characteristics and in terms of effective delivery system; it is important that any measures adopted now continue to be useful in the late sixties. Fortunately the relatively inexpensive measures discussed in section A could provide some early capabilities, without costly obsolescence later. Radiation meters in particular would continue to be useful in any program. Moreover, with forethought elements of the more ambitious programs examined in section B could provide early protection and still be improvable in the future. For example, light fallout shelters could be designed for conversion to medium blast-and-fallout shelters through the addition of better blast doors. Also, the first shelters built ought to have sufficient utilities to accept severe overcrowding; only as more shelters were built could the habitability standards set as an objective be approached.

VI. INTERACTIONS WITH OTHER ASPECTS OF NATIONAL DEFENSE

A. ACTIVE OFFENSE

The United States Strategic Air Command defends the population and economy principally by deterring general war through the threat of retaliation. Beyond this, if deterrence failed, SAC would continue to play a central role in the defense

of United States cities. It could (a) force the diversion of limited Soviet long-range forces to attacks on SAC rather than on cities, (b) limit total damage by making counterforce attacks on the Soviet strategic force and ending the war, and (c) by a combination of these, gain time for the population to take advantage of nonmilitary defenses. It should be stressed that protection for SAC is as important for its role in limiting destruction of cities as for its deterrent posture. It would be sensible to locate SAC bases and missile centers well away from large cities, in sparsely populated areas in the interior of the country. In addition, a program of sheltering planes, missiles, weapons, and essential support facilities would make an enemy's problems much more difficult. The importance for the civilian population of limiting the number of cities attacked on the first strike, and of obtaining warning of impending strikes, has already been indicated in the casualty calculations discussed in section II-C.

B. ACTIVE DEFENSE

Active defense and nonmilitary defense mutually support each other. The mere existence of active defense forces helps limit civilian casualties by compelling the enemy to launch larger raids, which are more likely to be detected and thus to provide warning. Moreover, active defense may cause further diversion of weapons from city targets to air defense targets and to the task of penetrating to SAC targets. Finally, active defense of the cities themselves, even though only partially effective, can limit total national casualties by compelling the attacker to limit the number of cities attacked, by reducing the number of bombs on target through attrition, by degrading the accuracy of the attack, and by forcing the attacker to design countermeasures which are expensive and reduce payloads. It is especially important to prevent an enemy from having a free ride in followup attacks, because without continuing resistance he could cause almost any level of casualties he wished.

On the other hand, nonmilitary defense measures contribute most importantly to active defense by making attainable levels of performance worthwhile. An effective nonmilitary defense system could sharply reduce the number of casualties per enemy bomb, and thus give an active defense system capable of screening out a substantial fraction of the enemy weapons, even if not all of them, a more important role in the national defense. Nonmilitary defense also helps active defense in more technical ways—such as by making the enemy attempt more accurate (and more easily disturbed) delivery systems, and by permitting the defensive use of larger atomic warheads at closer range.

C. SOVIET NONMILITARY DEFENSE

Nonmilitary defense should also be examined through the looking glass: what would be the implications for United States policy if the Soviet Union embarked on a major nonmilitary defense program? It is not widely realized that Russia already has a respectable program, including reinforced basement shelters and a program of mass education. It is true that the specifics of the Soviet program seem more appropriate to small-yield fission weapons than to large-yield thermonuclear weapons. But even the present program, given the warning inherent in making the first strike, would almost surely be able to reduce casualties significantly. Moreover, it could readily serve as the base for a more comprehensive program.

The Soviet Union would have several advantages over the United States in implementing a major shelter construction program. The real cost of heavy and medium shelters for the cities would be only about half those in the United States, because the Soviet urban population is smaller and less concentrated. Fallout shelters could be readily improvised for the rural population, because most existing structures are built with thick earth and timber walls and with small windows and doors. On the other hand, extensive protection of industrial capital for postattack recuperation and accumulation of large food stockpiles would probably be more difficult.

If the Soviet Union were to embark on a large-scale nonmilitary defense program, it could have important implications for United States defense policy. Nonmilitary defense might strengthen the resolve of Soviet leaders, and make it more difficult to deter them either from major provocation elsewhere in the world or from direct attack on the United States. In particular, it could make a Russian first strike appear more attractive. And if deterrence failed, hardening Soviet targets could make it more difficult for United States offensive forces to accomplish heavy retaliation.

VII. CONCLUSION: SOME POLICY SUGGESTIONS

A. A BROAD RESEARCH, DEVELOPMENT, AND PLANNING PROGRAM

The major conclusion of this study of nonmilitary defense is that there are more promising possibilities for alleviating the disaster of a nuclear war than have been generally recognized. There appear to be possibilities of providing inexpensive fallout protection for people outside blast areas, of constructing blast shelters capable of standing up to thousands of pounds per square inch, of carrying out strategic or tactical evacuation if sufficient warning is available, of limiting the long-term biological damage to the population resulting from total radiation, of adopting countermeasures to contain the strontium 90 problem even after very large attacks, of assuring a minimum supply of food immediately after the attack, of reconstructing destroyed industrial capital within much less than a generation, and of integrating nonmilitary defense measures with other aspects of national defense. Moreover, some hypothetical nonmilitary defense systems which have been examined appear to be capable of saving tens of millions of lives in the face of conceivable enemy attacks, and of preserving a foundation for meeting long-run radiation hazards and for postattack economic recuperation.

On the other hand, each of these possibilities is at present surrounded by considerable uncertainty, with respect to both performance and cost. There is a wide range in the probable costs of alternative nonmilitary defense systems, and such systems must be evaluated in conjunction with other elements in the United States national-defense posture. Further investigation is indicated, to pin down the uncertainties, to make sure that serious difficulties haven't been overlooked, and to provide a sounder basis for evaluation.

Accordingly, the principal policy suggestion stemming from this study is that the United States ought to undertake a serious research, development, and planning program in the field of nonmilitary defense. Such a program should be broad in that it addresses itself simultaneously to the whole complex of issues involved in nonmilitary defense, as touched on in this study. Such a program should also be detailed and concrete, so that if a comprehensive nonmilitary defense system is later decided upon, it could be initiated quickly.

It should be stressed that it does not appear sensible to embark on a comprehensive nonmilitary defense program now without such prior research. An ill-considered program could be costly, threatened with obsolescence, and inconsistent with other important elements of national defense.

An appropriate scope for such a research, development, and planning program can be illustrated with a \$200 million budget, spread over 2 or 3 years. In this connection, we may note that it costs \$500 million to \$1 billion to develop an intercontinental bomber, and \$1 billion to \$2 billion to develop an ICBM. Moreover, if nonmilitary defense measures involving billions of dollars should ultimately be adopted, such prior research could readily pay for itself by saving only a small percentage of the total cost.

A sensible allocation of funds to individual projects within a \$200 million budget has also been prepared. This detailed program is discussed in another document to be issued separately, but a brief summary is set forth in table 5. The goal was to make sure that every important subject was adequately covered, rather than to see that every dollar was spent economically. The detailed program should indicate, however, that the issues raised by nonmilitary defense are concretely researchable.

B. REORIENTATION OF PRESENT PROGRAMS AND EXISTING ASSETS

There appear to be a number of instances in which substantial nonmilitary defense capabilities appear to be attainable at modest cost, by reorienting present programs and the management of existing assets. Accordingly, a second general policy suggestion is that wherever such fairly inexpensive possibilities exist, they should be introduced, up to an additional cost of perhaps \$300 million. Such an inexpensive program might save millions of lives, facilitate economic recuperation, and phase into extensive shelter construction if that should later be decided upon. Three specific kinds of reorientation can be suggested.

TABLE 5.—A program of research, development, and planning in nonmilitary defense

[Millions of dollars]	
A. Personnel shelters.....	65
Example: 5. Detailed studies of shelters designed for 10 representative medium and small cities. The studies should proceed from engineering proposals through feasibility checks to final designs. Various levels of adequacy, phasing questions, and possibilities of future improvement should be considered. (\$6.)	
B. Mines.....	15
Example: 6. Preliminary design of underground plants in 20 important industries. Emphasis should be on modifying surface designs to exploit mine characteristics. The study should include all factors which influence the profitability of operations, not just construction costs. (\$3.)	
C. Conventional industrial shelters.....	5
Example: 1. Study of the practicability of protecting essential parts of plants in 20 important industries, using conventional protective construction. (\$1.)	
D. Private industry studies.....	15
Example: 1. Analysis of inventory protection in 20 important industries. Emphasis should be on fixed capital, working capital, and operating costs of alternative measures—transferring inventories to nontarget locations, constructed shelters near plant, mine shelters in available locations. If possible, studies should be contracted with leading firms. (\$2.)	
E. Special equipment and processes.....	15
Examples: Engineering design studies of excavating machines, blast doors, ventilation equipment, shelter utilities, intershelter communication, construction with salvaged materials, radiation shielding for vehicles.	
F. Anticontamination and fallout.....	30
Example: 4. Study of fallout countermeasures, including decontamination equipment, washdown systems, shielding methods, decontamination of food and water, changes in farming techniques. (\$13.)	
G. Medical aspects of shelters.....	10
Example: 7. Research in acute radiation therapy, including medicines to ameliorate the effects of temporary exposure, protective clothing, and methods of medical treatment. (\$2.)	
H. Food and agriculture.....	15
Example: 4. Controlled experimentation with various diets, aimed at developing lowest cost shelter rations and evaluating postwar survival diets. (\$3.)	
I. Expansion of Government studies.....	10
Example: 1. Investigation of nonmilitary defense adaptations of existing Government activities—joint-use construction of schools, Government buildings, highways; city planning; foreign-aid programs. (\$1.)	
J. Academic studies.....	5
Examples: Theory of the response of buried shapes to blast pressures, inducements to private firms to preserve obsolete machinery, social and psychological influences on shelter morale. Emphasis should be on 1-man projects which tap intellectual resources widely.	
K. Systems analysis.....	10
Analysis of performance and cost of nonmilitary defense systems in a wide variety of war situations, and of interactions between nonmilitary and military defense, is essential for evaluation of measures studied in other parts of the program.	
L. Miscellaneous.....	5
Total.....	200

First, planning in Government civilian agencies should be primarily oriented to a short thermonuclear war. The objective should be to protect civilians, aid their survival, and rebuild the economy, rather than to mobilize war production to support a large overseas army. A clarifying directive from the National Security Council would help to place mobilization planning, and the expenditures currently being made in this field, on a more plausible basis. Correspondingly, planning in the military departments might place greater emphasis on the interaction of military operations with nonmilitary measures to protect civilian society.

Second, the management of existing stockpiles should be reoriented insofar as practicable to support nonmilitary defense. The Government now owns about \$20 billion worth of industrial raw materials, machine tools, obsolete military stocks, and surplus agricultural commodities. Inexpensive actions to process, store, relocate, or protect these stockpiles might be initiated, as discussed in section V-A. Certainly the Government should not dispose of these stocks without first considering seriously their possible contribution to nonmilitary defense.

Third, current nonmilitary defense programs should be reoriented to emphasize improvised fallout protection, procurement and distribution of radiation meters, and arrangements for strategic and tactical evacuation of large cities. A realistic program of this sort on a reasonable budget (see sec. V-A above) could provide a sensible objective for existing agencies in the nonmilitary defense field, and thus make their efforts more productive.

C. PROMPT CONSIDERATION OF LONG-TERM MEASURES

Certain measures which might be incorporated in a comprehensive nonmilitary defense program would come to fruition only over a period of years. Such measures, therefore, ought to be considered and (if sound) brought into operation as soon as possible. Four specific long-term suggestions of this nature were developed in the study.

The first suggestion is a program to stimulate the creation of suitably located mine space. As discussed in section V-E, mine space seems to have many nonmilitary defense uses, and it should be possible to obtain such space much more cheaply by small premiums to mine operators over a period of years than in a crash program of mass excavation.

Second, an interesting idea which might contribute to the solution of institutional problems during postattack reorganization, and which might permit some of the costs of preattack measures for economic recuperation to be prefinanced outside the Federal budget, is a War Damage Equalization Corporation. Such a corporation might well sell insurance on a compulsory or voluntary basis to financial institutions, business firms, and individual property owners. These funds might then be invested in the accumulation of nonfood stockpiles, the creation of industrial shelters, and other measures which would increase the real assets available after a war. The insurance claims on the corporation could serve as a basis for restoring postattack operations of financial institutions and business firms, and for redistributing property losses more equitably among firms and individuals. Other arrangements to carry out these functions are of course also possible, and the entire subject deserves serious consideration.

Third, given clear and realistic orientation as to the nature of nonmilitary defense problems, private professional organizations ought to be able to make important contributions to their solution. To cite a single example, if the Government provided such guidance, the American Society of Civil Engineers might be quite helpful in developing structural designs for fallout shelters in small cities with peacetime as well as wartime uses.

The fourth suggestion has to do with initiation of long-term planning for governmental civilian agencies in the nonmilitary defense field. The objective should be to establish independent staffs whose full-time purpose is to keep abreast of prospective military and technical developments and to plan corresponding adaptations of current agency operations. Long-range planning is now accepted in the military departments, and it is equally important for nonmilitary defense.

**EXHIBIT C—STATEMENT ON CURRENT RESEARCH AND DEVELOPMENT
CONTRACTS OF THE FEDERAL CIVIL DEFENSE ADMINISTRATION**

**FEDERAL CIVIL DEFENSE ADMINISTRATION,
NATIONAL HEADQUARTERS,
Battle Creek, Mich.**

HON. CHET HOLIFIELD,
*Chairman, Subcommittee on Military Operations, Committee on Govern-
ment Operations, House of Representatives, Washington, D. C.*

DEAR MR. CHAIRMAN: During our appearance before your subcommittee on May 2, you requested that I submit certain information to the subcommittee on current research and development contracts of the Federal Civil Defense Administration. You also requested financial information concerning survival studies.

I am pleased to submit, herewith, the information which you requested.

Sincerely,

GERALD R. GALLAGHER,
Assistant Administrator, Research and Development.

**FEDERAL CIVIL DEFENSE ADMINISTRATION—STATUS OF CURRENT
RESEARCH AND DEVELOPMENT CONTRACTS**

INDEX

Contractual research advisory activities:		
1. The Advisory Committee on Civil Defense-----	\$40, 000	
2. The Committee on Fire Research and the Fire Research Conference-----	53, 000	
Radiological defense research and development:		
1. Radiological physics for civil defense-----	50, 000	
2. Radiological defense operations-----	350, 000	
3. Radiological reclamation-----	145, 000	
4. Radiological countermeasures manual-----	87, 500	
5. Pilot radiological defense operations plans-----	101, 500	
6. Transistorized loud speaker for geiger counter-----	1, 250	
7. Development of aerial survey instrument-----	25, 000	
8. Extension of upper wind data for fallout analysis-----	20, 000	
Health and medical research:		
1. Biological effects of blast-----	57, 000	
2. Biological aspects of nuclear radiation-----	100, 000	
3. National emergency medical care plans-----	150, 000	
4. National nursing education plan-----	80, 000	
5. Methods of treatment of plasma to inactivate hepatitis virus-----	58, 000	
6. Participation in the blood research program of the Army Medical Corps-----	15, 000	
Shelter research and development:		
1. Design study of deep underground rock shelters-----	18, 000	
2. Study of blast resistance of deep rock shelters-----	14, 000	
3. Design feasibility study of blast-resistant tunnel closures-----	18, 880	
4. Air-flow characteristics of blast valves-----	6, 000	
Warning equipment and systems studies:		
1. National emergency repeater alarm system-----	603, 000	
2. Telephone warning systems-----	48, 000	
Operations research:		
1. FCDA damage assessment system-----	80, 000	
2. Liaison with National Damage Assessment Center-----	23, 000	
3. Strategic framework-----	246, 000	
Emergency water supplies, sewage and waste disposal studies: 1. De- contamination of water supply, sewage, and waste disposal studies---		2, 500
Economic studies:		
1. Civilian survival supply—Requirements and development and methodology-----	100, 000	
2. Updating the resources file of the National Damage Assess- ment Center-----	9, 367	
Civil defense training and education evaluation: 1. Evaluation of train- ing effectiveness of courses taught by FCDA-----		50, 000

Human behavior research : I. Natural disaster studies.....	\$42,000
Nuclear field tests :	
1. Dome construction.....	92,000
2. Garage construction.....	193,000
3. Family shelters.....	37,000
4. Structure instrumentation.....	398,000
5. Foreign shelter construction.....	451,000
6. Door test.....	40,000
7. Blast valve design.....	40,000
8. Water decontamination.....	6,000

CONTRACTUAL RESEARCH ADVISORY ACTIVITIES

1. Title of contract : The Advisory Committee on Civil Defense.

(a) Date initiated : April 1, 1957.

(b) Contract completion date : December 31, 1958.

(c) Name of contractor : National Academy of Sciences-National Research Council.

(d) Amount of contract : \$40,000.

(e) Purpose : To advise FCDA in planning and carrying out research. Committee members are outstanding persons in the fields of science and technology.

The Committee is intimately acquainted with FCDA research problems and programs and advises frequently in connection with the conduct of its research programs.

No reimbursement is made to the contractor for the services of consultants and experts. Funds are used by the contractor to pay travel and subsistence allowances to committee members, clerical and administrative services, and expenses.

2. Title of contract : The Committee on Fire Research and the Fire Research Conference.

(a) Date initiated : February 1958.

(b) Contract completion date : February 1959.

(c) Name of contractor : National Academy of Sciences-National Research Council.

(d) Amount of contract : \$53,000.

(e) Purpose : The purpose was to establish a continuing group of experts from appropriate fields of science and technology to provide advisory and consulting services in the field of fire research, coordinate existing research programs to prevent unnecessary duplication, and encourage and stimulate a national research effort to provide scientific knowledge for proper guidance in the development of new and unconventional techniques and equipment designed to increase our wartime fire defense capabilities.

Included in the scope of the contract has been the identification of problem areas where deficiencies exist in fundamental scientific knowledge and the preparation of a comprehensive national fire program for fire research. This program is now at the point of completion and is expected to serve as a frame of reference for all research projects undertaken in this field by both Government organizations and institutions supported by the insurance companies and industry.

Services of experts and consultants are not reimbursed. Funds are used for travel and subsistence allowances to committee members and for clerical and administrative support.

RADIOLOGICAL DEFENSE RESEARCH AND DEVELOPMENT

1. Title of contract : Radiological physics for civil defense.

(a) Date initiated : July 1957.

(b) Contract completion date : June 30, 1958.

(c) Name of contractor : National Bureau of Standards, United States Department of Commerce.

(d) Amount of contract : \$50,000.

(e) Purpose : This is a continuing project. The research involves complex mathematical computations with high-speed electronic computer relating to the characteristics of nuclear radiation, both the initial radiation produced at the time of detonation and the residual radiation produced by fallout. These characteristics must be fully understood in order to design protective structures.

Knowledge of the energy spectrum, that is amounts of radiation energies present at different times after burst, is important because the penetrability of radiation depends on its energy. The results of these studies are being used by other FCDA contractors which will be described later in developing radiological defense plans.

The National Committee on Radiation Protection, chaired by Dr. Lauriston Taylor, Chief of the Atomic and Radiation Physics Division of the National Bureau of Standards, is providing technical guidance to the conduct of this study.

2. Title of contract: Radiological defense operations.

(a) Date initiated: February 1958.

(b) Contract completion date: February 1, 1959.

(c) Name of contractor: University of California.

(d) Amount of contract: \$350,000.

(e) Purpose: The results of theoretical studies performed by the National Bureau of Standards and the Naval Radiological Defense Laboratory are furnished to the University of California who applies them in developing practical civil defense operations.

Local civil defense planners must estimate the amount of safe shelter afforded by large buildings and basements of small buildings as a basis for determining deficiencies and the amount of new shelter capacity which should be provided through shelter construction.

The university has developed simple standards through the use of high-speed electronic computer calculations from surveys of sample communities which can be applied by planners in any community in the United States.

Other studies include improvement of knowledge of physical characteristics and biological effects of initial and residual nuclear radiation and of the variables that influence distribution of radioactive fallout, and also improvement of knowledge and development of practical methods for reducing the effects of radiation on people either through reducing radiation doses or of the biological effect of various doses.

3. Title of contract: Radiological reclamation.

(a) Date initiated: April 1958.

(b) Contract completion date: June 1959.

(c) Name of contractor: Naval Radiological Defense Laboratory.

(d) Amount of contract: \$145,000.

(e) Purpose: It is the objective to develop information and criteria pertinent to the detailed planning and implementation of large-scale reclamation operations.

Two immediate objectives are: (a) the determination of the logical sequence for reclamation operations with emphasis on the "cost" in terms of radiological exposure as well as finances, support, and logistic factors; (b) the development of "rules of thumb" for various cost factors.

The approach to this problem will be to examine for completeness and adequacy, information on the methods, effectiveness and "cost" of reclamation operations. Requirements for additional information will be established and supplied from such sources as are available. Sequences of operation will be investigated to establish the most logical sequence in various situations and environments. The passive areas; that is, residential, factory, outside industrial, etc., will be defined and categorized. The "cost" of reclaiming these kinds of areas will be estimated for various operational and radiological situations. From these estimates, general "cost factors" will be developed which will allow approximations to be made of the magnitude of the recovery operations.

4. Title of contract: Radiological Countermeasures Manual.

(a) Date initiated: April 1, 1958.

(b) Contract completion date: June 30, 1959.

(c) Name of contractor: Naval Radiological Defense Laboratory.

(d) Amount of contract: \$87,500.

(e) Purpose: To develop a manual for civil defense comparable to the NRDL manual, entitled "Radiological Recovery of Fixed Military Installations." Operational procedures will be developed which are applicable to industrial, residential, and rural areas.

As a preliminary to the manual, it is necessary that all available data, including classified data prepared for military applications, be summarized and a critical evaluation be made. Theoretical and experimental studies performed by the military can contribute in an important way to the technical basis for the development of a civil radiological defense program.

Evaluation is required for the following reasons:

(a) Much of the experimental work was performed under conditions inappropriate to the civil defense problem and must be extrapolated to the necessary conditions or be discarded.

(b) Some of the experimental work was invalid because of faults in the experiment as disclosed by later work. This material must be identified.

(c) Security requirements can only be met in many cases by divorcing pertinent information from the military problems from which they were developed. Extreme difficulties have been experienced in the past with respect to the transfer of the original material to FCDA and its contractors.

The results of this study are intended to constitute an evaluated, correlated, and documented set of information for use by FCDA in pursuing future research and development, and as a basis for improving the national radiological defense program.

5. Title of contract: Pilot radiological defense operational plans.

(a) Date initiated: November 1, 1957.

(b) Contract completion date: June 30, 1958.

(c) Name of contractor: Technical Operations, Inc.

(d) Amount of contract: \$101,500.

(e) Purpose: To prepare model radiological defense plans for State, area, sector, and local levels in New England.

These plans are based on data developed under a contract with the University of California.

A manual of procedures is to be prepared under this contract which can be adopted by all States.

6. Title of contract: Transistorized loud speaker for geiger counter.

(a) Date initiated: February 1958.

(b) Contract completion date: August 1958.

(c) Name of contractor: Jordan Electronics division of Victoreen Instrument Co.

(d) Amount of contract: \$1,250.

(e) Purpose: This loud speaker is to be used as an aid for instructing and demonstrating to large groups of people the nature and physical characteristics of radioactivity. The contractor is to develop, test, evaluate, and prepare specifications for a prototype speaker to be delivered to FCDA within the contract period.

7. Title of contract: Development of an aerial survey instrument.

(a) Date initiated: December 1956.

(b) Contract completion date: June 30, 1958.

(c) Name of contractor: United States Atomic Energy Commission.

(d) Amount of contract: \$25,000.

(e) Purpose: Develop, field test, evaluate, prepare performance specification, and deliver to FCDA five prototype aerial survey instruments.

These instruments are for use in rapidly determining the intensity of radiation in large areas likely to be contaminated following a nuclear attack. Some of the factors considered in these devices are response to time and methods of compensating for altitude. The study includes evaluating the desirability of using automatic compensation by means of radar altimeters and remotely located detecting elements. The design has been stabilized and a subcontract has been awarded to determine the capability of industry to mass produce these instruments.

8. Title of contract: Extension of upper wind data for fallout analysis.

(a) Date initiated: September 1957.

(b) Contract completion date: September 1958.

(c) Name of contractor: Weather Bureau, Department of Commerce.

(d) Amount of contract: \$20,000.

(e) Purpose: The research will extend the analysis of the upper air wind data for the period from March 1953 through February 1956 to 100,000 feet and process the data from March 1956 through February 1958 to the same height. An earlier research project with the Weather Bureau provided data from March 1951 through February 1956 up to 80,000 feet but this height is not considered sufficient for complete fallout studies.

A series of charts will be provided for 41 places throughout the United States which will present the percentage of time the annual effective winds that would affect fallout, blow in the various directions, and at what speeds. The results of this study will be incorporated in radiological defense studies at the University of

California in the planning of shelter effects and can be used by local civil defense groups for consideration in selecting control centers, relocation sites, warehouses, etc.

HEALTH AND MEDICAL RESEARCH

1. Title of contract : Biological effects of blast.

(a) Date initiated : June 1957.

(b) Contract completion date : July 1958.

(c) Name of contractor : Lovelace Foundation, Albuquerque, N. Mex.

(d) Amount of contract : FCDA share, \$57,000.

(e) Purpose : To determine the biological effects on the human body of blasts by conventional, atomic, and thermonuclear weapons through the extrapolation of results obtained from biological specimen tests.

There exist many gaps in our knowledge of the biologic effects of blast on man and animals. These studies will determine the three principal ways in which blast can produce injury. Primary or direct effects of the blast; secondary, injuries caused by missiles set in motion by blast; and tertiary, or injury resulting when the human body is displaced by blast effects. Unknown effects of blast which are being studied are results of magnitude, rate of buildup, and duration of overpressure on body surfaces. Results of reflected pressures within structures and their biologic effects will be determined as well as the effect of the inhalation of dust set in motion by blast within structures.

The results of these studies will be applied to (1) design of shelters and other types of buildings, doors, and ventilators which will give the greatest protection against blast to occupants; (2) determine the mechanism by which blast produces injury to man; (3) develop methods to prevent such injury.

2. Title of contract : Biological aspects of nuclear radiation.

(a) Date initiated : January 1958.

(b) Contract completion date : January 1958.

(c) Name of contractor : United States Naval Radiological Defense Laboratory.

(d) Amount of contract : 1958, \$100,000.

(e) Purpose : This is an extension of a project initiated in 1956 and is designed to improve our knowledge of the manner in which ionizing radiation affects human body producing injury and death, and to develop methods of diagnosis and treatment of radiation illness which will result from nuclear weapon detonation.

There are many gaps in our knowledge of the biomedical effects of radiation, since this is a relatively new field in medicine. These studies on biological specimens are concerned with :

1. Methods for the early diagnosis of radiation injury.

2. Development of treatment methods which will reduce mortality, alleviate suffering and mitigate the effects of nonfatal radiation injury.

3. The internal effects of radiation resulting from inhalation or ingestion of radioactive material from fallout. This includes the deposition of radioactive material in bone which can produce cancer.

4. The biological effects of deeply penetrating radiation. These studies are to determine those vital parts of the body most affected by radiation such as the intestinal tract, blood-forming organs, and endocrine glands.

5. Surface effects of radiation to determine the results of deposition of fallout on the skin surface.

The results of these studies will be applied to methods for the protection of the population against radiation hazards and for methods of treatment of radiation injury.

3. Title of contract : National emergency medical care plan.

(a) Date initiated : July 1957.

(b) Completion date : November 1958

(c) Name of contractor : American Medical Association.

(d) Amount of contract : \$150,000.

(e) Purpose : To study, develop, and recommend the planning, training, and operational organization needed as a basis for a national emergency medical care plan as a part of the national plan. The study involves the entire medical and public-health aspects of medical care, both preventive and curative under emergency conditions.

To plan for the treatment and care of casualties and noncasualties prior to, during, and after a thermonuclear attack upon the Nation, including recommending a plan for postattack sorting of casualties and determining priorities for treatment.

All information necessary for developing an organizational plan which will result in the optimum of medical care to the Nation will be collected. This will include the utilization of professional and nonprofessional personnel of the medical and allied professions; a determination of the functions and responsibilities that may be reallocated to allied and paramedical personnel; a plan for the content of training and education programs for all medical and health personnel; determination of the minimum medical facilities to execute the plan.

The information which will evolve from this study will enable FCDA to write a practical emergency medical care plan. It will include the duty assignment that all medical and paramedical personnel will assume and it will determine the optimum use of all remaining and emergency medical facilities in the postattack phase. The training and education program will recommend the content necessary to prepare personnel for their wartime role which will differ from peacetime practice.

4. Title of contract: National nursing education plan.

(a) Date initiated: January 1958.

(b) Completion date: July 1959.

(c) Name of contractor: National League of Nursing, Inc.

(d) Amount of contract: \$80,000.

(e) Purpose: To prepare nurses for their role in civil defense and disaster nursing through education; to study nursing curriculums and programs to determine how civil defense and disaster nursing can be included in existing courses.

The levels of nursing education to be studied are: 3-year basic curriculum, 4-year basic collegiate curriculum, practical-nurse program, graduate-nurse program, in-service program for nursing service personnel.

It is expected that these nursing curriculums and programs will have civil defense and disaster nursing integrated in their content and that they will be available as guidelines for other schools of nursing to use in developing similar programs.

5. Title of contract: Methods of treatment of plasma to inactivate hepatitis virus.

(a) Date initiated: June 1956.

(b) Completion date: January 1959.

(c) Name of contractor: National Academy of Sciences.

(d) Amount of contract: \$58,000.

(e) Purpose: To find a means of processing whole blood plasma for use in transfusions and shock therapy which will be free from the danger of contamination with the hepatitis virus.

As long as whole blood plasma is used as processed by existing methods, contamination with the hepatitis virus is a possibility because of the questionability of the ultraviolet method of sterilization. At least 9 commercial laboratories are working with the National Academy of Sciences on this project to devise foolproof methods of processing to eliminate this danger. The necessity for prolonging the life of red blood cells is of great importance to FCDA in order that whole blood can be held longer, as well as transported longer distances than the present 21-day life will allow. Through various chemical means, there are indications that blood can be treated to prolong its life, thereby greatly easing the logistical problems of blood distribution during periods of major disaster. It is likely that these studies will be continuing.

6. Title of contract: Participation in the blood research program of the Army Medical Corps.

(a) Date initiated: February 1951.

(b) Contract completion date: July 1958.

(c) Name of contractor: National Academy of Sciences.

(d) Amount of contract: This is a contract made by the Department of the Army but supported by the Departments of the Navy and Air Force and the Federal Civil Defense Administration. Our annual contribution is \$15,000 of the \$190,000 annual cost.

(e) Purpose: This expenditure is to support a continuing contract relating to research on plasma volume expanders, nasogastric feedings, and other research relating to blood and shock therapy. As results or progress are reported, these are applied to improving the civil defense blood and shock therapy program.

Plasma volume expanders include synthetic chemicals such as Dextran which can be used in many cases of shock and hemorrhage to restore blood

volume. The development of additional expanders which can be substituted for human whole blood and plasma will greatly facilitate the treatment of shock in a mass casualty situation. These products are much cheaper than blood derivatives and have a long shelf life.

SHELTER RESEARCH AND DEVELOPMENT

1. Title of contract: Design study of deep underground rock shelters.

(a) Date initiated: December 1957.

(b) Completion date: March 1958.

(c) Name of contractor: Guy B. Panero, consulting engineers.

(d) Amount of contract: \$18,000.

(e) Purpose: This contract covers the design of a system of shelters several hundred feet deep in the rock stratum such as exists under many of our cities. All factors relating to design layout, construction techniques, entrance location and design, and habitability were investigated. A need existed for an investigation of the merit of deep shelters to assure that the standards and criteria developed by FCDA take into consideration all factors and reflect the most practical plan possible. Information was compiled regarding the geological formation found under the selected cities. Cost estimates were made for use in future planning.

The general objective of this contract was to determine the feasibility of deep shelters, including a refinement of information pertinent to shelter studies developed in previous preliminary investigations concerning the use of mines, and development and adaptation of various underground areas in self-supporting rock formations for personnel shelter purposes. FCDA evaluation of the study is continuing.

2. Title of contract: Study of blast resistance of deep rock shelters.

(a) Date initiated: May 1958.

(b) Completion date: September 1958.

(c) Name of contractor: Armour Research Foundation.

(d) Amount of contract: \$14,000.

(e) Purpose: A previous study by another contractor has developed preliminary design layout, construction techniques, habitability, and cost for a system of shelters 800 feet below ground for the daytime population of the Borough of Manhattan. A technical review of the geological formations and a theoretical analysis of shock effects of surface-burst nuclear weapons will be made to determine the vulnerability of this shelter system. Other sites—Chicago, Pittsburgh, Detroit, Kansas City, Cleveland, and boroughs adjacent to Manhattan—will be investigated to determine the influence of the local geology to degree of protection.

3. Title of contract: Design feasibility study of blast-resistant tunnel closures.

(a) Date initiated: November 1957.

(b) Completion date: June 1958.

(c) Name of contractor: Armour Research Foundation.

(d) Amount of contract: \$18,880.

(e) Purpose: Various cities have contemplated construction of tunnels, both vehicular and subway, and civil defense officials have requested information on the desirability of incorporating protective construction with the original transportation function. The problem of resisting the shock wave propagated through the tunnel, when a portion of the tunnel is destroyed by the crater of a nuclear weapon, does not exist for isolated shelters. Thus, a tunnel shelter is subjected to hazards with a higher degree of probability of occurrence, and the feasibility of constructing closures to resist the internal shock wave needs demonstration. For the purpose of the study, it is assumed that a megaton nuclear weapon will be detonated over the tunnel, and a similar weapon detonated inside the tunnel. These studies are intended to determine the technical and economic feasibility of compartmenting tunnels.

4. Title of contract: Airflow characteristics of blast valves.

(a) Date of initiation: May 1958.

(b) Completion date: October 1958.

(c) Name of contractor: Bureau of Reclamation, Department of Interior.

(d) Amount of contract: \$8,000.

(e) Purpose: The blast valves developed for closing ventilating intake and exhaust openings have been tested at the Nevada Test Site to demonstrate their ability to close quickly and to withstand the shock load. The continued development and use of the valves requires that laboratory tests be made to determine the air-pressure drop associated with varying rates of airflow through the valves. The Bureau of Reclamation Laboratories in Denver have the apparatus required for these tests and their personnel are well qualified for the work.

WARNING EQUIPMENT AND SYSTEMS STUDIES

1. Title of contract: National emergency alarm repeater system (Project No. CD-58-EN 100.2).

(a) Date initiated: October 1957.

(b) Completion date: April 1959.

(c) Name of contractor: Midwest Research Institute.

(d) Amount of contract: \$603,000.

(e) Purpose: The purpose of this contract is to develop a powerline warning system having the capabilities of being operated from one of several single points throughout the Nation. This warning system will be capable of operation on a nationwide basis and will permit the transmission of warning from the originating point into the homes of all users of electric power on interconnected systems. The research being conducted at this time is a field test on a large power network to determine the optimum methods of signal generation using saturable reactors in the power system as a means of producing the signal. The tests will reveal the optimum point or points for inserting the signal into the power system and the proper means for repeating this signal into other networks.

Designs of several prototype receivers will be studied and evaluated as to their reliability, low cost and freedom from false alerts. From these prototype designs it is anticipated that final specifications may be drawn that will permit manufacturers to produce an economical warning receiver that may be plugged into the 110 alternating current outlet in any home, school, or factory providing a means of warning to the occupants of these buildings.

The field tests will confirm the theoretical study that is being made in conjunction with these tests as well as the analyzer studies of the power system and will provide the necessary engineering knowledge to enable a nationwide system to be installed. The tests will also provide information as to the most economical way of using the powerlines as a warning system.

This contract is the result of previous work that had been performed by the Midwest Research Institute on the use of powerlines as a means of conveying a warning signal.

2. Title of contract: Telephone warning systems.

(a) Date initiated: May 1956.

(b) Completion date: July 1958.

(c) Name of contractor: Armour Research Foundation, Chicago, Ill.

(d) Amount of contract: \$48,000.

(e) Purpose: The purpose of this contract is to investigate the use of telephone systems as a means of warning in the event of an enemy attack. Systems have been studied and a field test conducted using a small telephone exchange to provide the warning. Two methods of approach to the problem were used. In one the sequential ringing of the subscriber's telephone in a distinctive manner was investigated. The other system used a black box which was placed on the subscriber's telephone and upon receiving a signal from the telephone exchange sounded a warning. This method also had the capability of giving voice instructions over the black box to all points simultaneously. This contract was originally divided into two phases. The first phase was a theoretical study of the feasibility of using telephones as a warning system and the second phase was a field test to confirm the determinations that had been made in phase 1. It is contemplated that in the future, further research on telephone warning systems may be conducted to determine more economical methods of producing a signal from the telephone exchange. It appears at this time that a telephone warning system only offers a capability of local warning and is not suitable as a nationwide warning system. The analysis of the report is continuing.

OPERATIONS RESEARCH

1. Title of contract : FCDA damage assessment system.

(a) Date initiated : October 22, 1957.

(b) Contract completion date : October 22, 1958.

(c) Name of contractor : Stanford Research Institute.

(d) Amount of contract : \$80,000.

(e) Purpose : This contract is for work in the broad field of operations research. It has three identifiable areas of study. Each will be discussed separately. The current work is being undertaken as a refinement of completed studies inaugurated in prior fiscal years.

As the name implies, the damage assessment system is a means for rapidly estimating the damage (to people and resources) resulting from an enemy attack on our country. These estimates are required as bases for decisions in an emergency situation.

The system is a computing program using an electronic computer. It has four parts :

1. *A model of the country.*—This is an arithmetic model in which people and a limited number of resources of especial significance to FCDA are represented by numerical quantities located at points which are given geographic coordinates.

2. *A model of the attack.*—This, too, is an arithmetic model in which weapon and wind data are represented by numerical quantities. Each weapon is represented by numerical measures of the yield, the height of burst, and the geographic coordinates of its ground zero. Average winds for each of a number of regions are represented by numerical measures of their velocity and direction.

3. *A model of weapon effects.*—This is a mathematical model in which weapon effects are represented by numerical quantities. For direct effects, these quantities are measures of the probability of destruction related to the distance from ground zero for a variety of weapon yields and burst heights. For fallout, the quantities are intensity and dose at various points, and the probability of being a casualty.

4. *A computing procedure.*—By this procedure, the electronic computer combines the mathematics of the weapon effects model with the numbers of the models of the country and the attack. The product is an estimate of the numbers of people and resources surviving.

While this system was originally designed for postattack use—and will be so used—it also has an important preattack usability. War-gamed attacks are fed into the system and estimates of attack effects derived for use as bases for planning.

It is expected that, at the completion of the work under the present contract, the FCDA bomb damage assessment system will be workable and will need little further refinement. However, there will be a continuing need for updating of population and resource data. It is intended that this work be done by other than the present contractor.

2. Title of contract : Liaison with National Damage Assessment Center.

(a) Date initiated : October 22, 1957.

(b) Contract completion date : October 22, 1958.

(c) Name of contractor : Stanford Research Institute.

(d) Amount of contract : \$23,000.

(e) Purpose : FCDA is obligated by DMO I-26 to participate with the Office of Defense Mobilization and the Department of Defense in the National Damage Assessment Center. In support of this participation, the Stanford Research Institute is rewriting the FCDA damage assessment system computing program so that it may be run on the NDAC computer. Thus, the working FCDA system is made available to the entire executive branch.

In addition, there is need for liaison between the two systems to avoid unnecessary duplication. This contract provides this liaison through the period in which FCDA is building the competence to do it with its own staff.

3. Title of contract : Strategic framework.

(a) Date initiated : October 22, 1957.

(b) Contract completion date : October 22, 1958 (present contract).

(c) Name of contractor : Stanford Research Institute.

(d) Amount of contract : \$246,000.

(e) Purpose: Nonmilitary defense must operate in a two-sided strategic situation. Each side has offensive capabilities; each has active and nonmilitary defenses. The task of nonmilitary defense must be identified and measured in this strategic framework. The nonmilitary defense system must be tested and evaluated within this framework. It is the purpose of this contract to design the strategic framework, to fill in some of the numbers for the offensive and defensive capabilities, and to start evaluating our nonmilitary defense within it. Since the offensive and defensive capabilities of both sides are continually changing, this will be a continuing task. Thus, the completion date shown refers only to the present contract.

EMERGENCY WATER SUPPLY, SEWAGE, AND WASTE DISPOSAL STUDIES

1. Title of contact: Decontamination of biological and chemical warfare agents in potable water supplies.

(a) Date initiated: May 1958.

(b) Completion date: August 1958.

(c) Name of contractor: United States Department of the Army, Engineering Research and Development Laboratories, Corps of Engineers.

(d) Amount of contract: \$2,500.

(e) Purpose: The purpose of the contract is to develop procedures by which VX gas can be removed from water, using the facilities and chemicals available in a conventional type municipal water treatment plant. This work is to be additional to the basic continuing program of the ERDL, Corps of Engineers, Fort Belvoir, Va., in developing and testing methods effective in the removal of chemical warfare agents from potable water supplies for military field use.

ECONOMIC STUDIES

1. Title of contract: Civilian survival supply-requirements development and methodology.

(a) Date initiated: March 1958.

(b) Completion date: Open ended, except for completion with respect to selected medical items data by July 1958.

(c) Name of contractor: Business Defense Services Administration, Department of Commerce.

(d) Amount of contract: \$100,000.

(e) Purpose: To improve the capabilities of FCDA in the estimation of requirements and determination of available supplies. The various exercises, including Operation Alert 1957, have demonstrated the inadequacies of information currently available and the necessity for improved computational methods if we anticipate factual preattack planning or postattack operational capability. This project is to correct this inadequacy, by surveying the availability of essential survival items, preparing tapes for inclusion in the National Damage Assessment Center's resources file, and developing methods for quickly determining location and quantity of survival items in the distribution channels.

2. Title of contract: Updating the resources file of the National Damage Assessment Center with the 1955 annual survey data.

(a) Date initiated: March 1958.

(b) Completion date: July 1958.

(c) Name of contractor: Bureau of Census.

(d) Amount of contract: \$9,367. (ODM and Bureau of Census are sharing equally with FCDA. Total amount is \$28,100.)

(e) Purpose: To update the resources file from data in the annual survey of 1953 to that of 1955. The earlier data are rapidly becoming obsolete and the value of damage assessment work at the National Damage Assessment Center is largely dependent upon the quality of data in its resource file. Both preattack planning and postattack damage analysis require accurate data on manufacturing establishments to be meaningful and to provide a basis for decisions affecting our national survival.

CIVIL DEFENSE TRAINING AND EDUCATION EVALUATION

1. Title of contract: Evaluation of training effectiveness of courses taught by FCDA.

- (a) Date initiated: May 1957.
- (b) Completion date: February 1959.
- (c) Name of contractor: Applied Psychological Services.
- (d) Amount of contract: \$50,000.

(e) Purpose: This contract was initiated in order to obtain an evaluation of training effectiveness of civil defense courses relating to (a) administration, (b) operations, (c) evacuation, and (d) rescue taught at the FCDA Staff College, the Olney rescue facility, and in States by the FCDA traveling team. The contractor is required to develop and provide data to the Government on (a) validity of training, (b) the percent of graduates still working in civil defense, (c) the influence of training on performance by graduates, (d) extraneous materials, (e) gaps in training, and (f) adequacy of training.

The contractor will make recommendations for the revision and modification of the aforementioned courses, and will furnish the Government with instruments and techniques that may be used in conducting followup studies in the future. His work should result in materially improving the quality of FCDA instruction in its Staff College and by its traveling teams.

HUMAN BEHAVIOR RESEARCH

1. Title of contract: Natural disaster studies.

- (a) Date initiated: June 1957.
- (b) Completion date: June 1958.
- (c) Name of contractor: National Academy of Sciences-National Research Council (NAS-NRC).
- (d) Amount of contract: \$42,000.

(e) Purpose: To obtain consultative and research services upon questions and problems of human behavior in disaster and civil defense. Summaries and analyses of existing data and scientific material on human behavior in disaster, with special reference to information gained from the study of peacetime disasters, are being prepared. Limited on-the-spot studies of peacetime disasters are made for the purpose of obtaining information relevant to civil defense operational functions. The disaster research group further assists in the formulation and conduct of research projects designed to secure more definitive information on human factors affecting civil defense planning, operations, or systems; evaluates the applicability to civil defense; and makes available to the Government the results of other research conducted by the National Research Council in the field of human behavior in disaster.

NUCLEAR FIELD TESTS

Preface

Contracts described in this section of the report include projects for which the actual construction and nuclear field testing have been completed but for which final evaluation reports have not been received.

1. Title of contract: Dome construction.

- (a) Date initiated: February 1957.
- (b) Completion date: June 1957.
- (c) Name of contractor: Lembke, Clough & King.
- (d) Amount of contract: \$92,000.

(e) Purpose: Contract was awarded to perform the construction of the test domes. Three 50-foot-diameter reinforced concrete dome structures were constructed, at ranges of about 20, 35, and 70 pounds per square inch exposed to side overpressure. Report being written by American Machine & Foundry.

2. Title of contract: Garage construction.

- (a) Date initiated: February 1957.
- (b) Completion date: June 1957.
- (c) Name of contractor: Lembke, Clough & King.
- (d) Amount of contract: \$193,000.

(e) Purpose: This contract provided for the construction of the dual-purpose parking garage at the approximate 35 p. s. i. range. Structure was 90 by 90 feet, supported by 9 columns and was covered by 3 feet of earth. Contract

included all construction operations. Report to be written by Amman & Whitney.

3. Title of contract: Family shelters.

(a) Date initiated: April 1957.

(b) Completion date: June 1957.

(c) Name of contractor: Reynolds Electric & Engineering.

(d) Amount of contract: \$37,000.

(e) Purpose: This cost-plus-fixed-fee contract was awarded to the service contractor of AEC. It provided for the construction of 3 reinforced concrete family shelters at the 30-, 48-, and 70-pounds-per-square-inch ranges. Report being written by FCDA.

4. Title of contract: Structure instrumentation.

(a) Date initiated: October 1956.

(b) Completion date: May 1958.

(c) Name of contractor: United States Department of the Army, Ballistics Research Laboratory, and Armour Research Foundation.

(d) Amount of contract: \$398,000.

(e) Purpose: Scientific instrumentation of test projects was provided by Ballistics Research Laboratory and Armour Research Foundation. All shelter structures in the FCDA program and the French and German shelters were instrumented with both electronic and self-recording equipment. The results of the instrumentation have been provided to the projects concerned and will be included in the final reports.

5. Title of contract: Foreign shelter construction.

(a) Date initiated: April 1957.

(b) Completion date: August 1957.

(c) Name of contractor: Sierra Construction Corp.

(d) Amount of contract: \$451,000.

(e) Purpose: This contract provided for the construction of 9 German and 5 French structures at the Nevada Test Site. Components and equipment for the structures were provided by the government concerned. Instrumentation for these structures is included in the previous item. Construction cost was financed by the French and German Governments. Reports are being written by Amman & Whitney.

6. Title of contract: Door test.

(a) Date initiated: April 1957.

(b) Completion date: June 1957.

(c) Name of contractor: Reynolds Electric & Engineering.

(d) Amount of contract: \$40,000.

(e) Purpose: This contract provided for the installation and equipping of 10 industrial doors. The doors were of different materials and methods of construction. They were tested at 3½ and 7 pounds per square inch. Report being written by FCDA.

7. Title of contract: Blast valve design.

(a) Date initiated: January 1957.

(b) Completion date: May 1957.

(c) Name of contractor: Arthur D. Little, Inc.

(d) Amount of contract: \$40,000.

(e) Purpose: This contract provided for the design, development, and fabrication of 11 antiblast valves by Arthur D. Little, Inc. In addition to the actual prototypes to be provided for the test, the contractor provided specifications and drawings for use of FCDA in future blast valve development. Report is being written by FCDA.

8. Title of contract: Water decontamination.

(a) Date initiated: May 1957.

(b) Completion date: November 1957.

(c) Name of contractor: United States Department of the Army, Corps of Engineers.

(d) Amount of contract: \$6,000.

(e) Purpose: This contract with the Corps of Engineers was an attempt to develop methods and techniques for field decontamination of water. This was an extension of work in program by the corps and was partially financed by FCDA because of our interest in radiological decontamination. Report is being written by the Corps of Engineers.

AREA	PHASE I HISTORY			POSPP HISTORY	
	CONT EXEC DATE	OBLIGATED	EXP DATE	CONTRACT NO	CONT EXEC DATE
REGION - 1					
CONNECTICUT	3 56	30 000	3 56	CD S 56 22A	10 1 56
MAINE	3 56	25 000	10 56	CD S 56 19A	10 1 56
MASSACHUSETTS	4 56	25 000	8 56	CD SP 57 14	11 19 56
NEW HAMPSHIRE				CD SP 57 27	1 8 57
NEW JERSEY					
TRENTON				CD SP 57 35	1 29 57
NEW YORK				CD SP 57 31	1 14 57
NEW YORK CITY	12 55	108 200	10 56	CD S 56 4A	12 5 56
RHODE ISLAND	2 56	43 300	10 56	CD S 56 15A	10 10 56
VERMONT				CD SP 57 39	2 28 57
REGION - 2					
DELAWARE					
KENTUCKY				CD SP 57 10	10 22 56
MARYLAND	2 56	42 500	10 56	CD S 56 8A	11 5 56
OHIO	3 56	203 300	3 56	CD S 56 20A	10 17 56
PENNSYLVANIA					
PHILADELPHIA	3 56	50 000	10 56	CD S 56 21A	12 5 56
VIRGINIA				CD SP 57 36	2 5 57
DISTRICT OF COLUMBIA	10 55	11 317	3 56	CD SP 57 22	1 2 57
WEST VIRGINIA				CD SP 57 29	1 14 57
REGION - 3					
ALABAMA	4 56	23 750	10 56	CD SP 57 17	12 6 56
FLORIDA	2 56	8 500	8 56	CD SP 57 21	12 26 56
GEORGIA				CD SP 57 49	5 10 57
MISSISSIPPI				CD SP 57 13	11 1 56
NORTH CAROLINA	6 56	22 700	11 56	CD SP 57 19	12 17 56
SOUTH CAROLINA					
TENNESSEE	4 56	44 175	10 56	CD SP 57 6	10 2 56
PUERTO RICO				CD SP 57 45	4 10 57
VIRGIN IS.					
CANAL ZONE					
REGION - 4					
ILLINOIS	1 56	51 000	10 56	CD S 56 7A	10 1 56
INDIANA					
MICHIGAN	8 56	68 750	12 56		
MISSOURI					
ST. LOUIS	2 56	56 580	10 56	CD S 56 10A	10 1 56
KANSAS CITY	5 56	25 465	8 56	CD SP 57 23	1 28 57
WISCONSIN				CD SP 57 47	4 4 57
REGION - 5					
ARKANSAS	3 56	10 475	10 56	CD S 56 17A	10 11 56
LOUISIANA	2 56	15 000	10 56	CD SP 57 9	10 11 56
NEW ORLEANS	10 55	25 500	11 56	CD SP 56 1-2	8 17 56
NEW MEXICO					
OKLAHOMA	1 56	10 090	10 56	CD S 56 5A	10 11 56
TEXAS					
HOUSTON	11 55			CD S 56 3	11 23 55
REGION - 6					
COLORADO	2 56	23 400	10 56	CD S 56 12A	10 12 56
IOWA					
KANSAS				CD SP 57 43	3 21 57
MINNESOTA	3 56	41 029	10 56	CD S 56 16A	10 12 56
NEBRASKA	2 56	22 270	10 56	CD S 56 14A	10 12 56
NORTH DAKOTA	1 57	6 278	12 56	CD SP 57 50	4 22 57
SOUTH DAKOTA				CD SP 57 37	2 15 57
WYOMING					
REGION - 7					
ARIZONA					
CALIFORNIA	3 56	198 000	11 56	CD SP 57 38	2 13 57
IDAHO					
MONTANA					
NEVADA					
OREGON	7 56	52 270	2 57	CD SP 57 40	3 4 57
UTAH					
WASHINGTON	6 56	67 672	11 56		
HAWAII					
ALASKA					

POSPP HISTORY-CON.				OSP CONTRACT STATUS			
OBLIGATED	EXP DATE	RPT DUE DATE	CONTRACT NO	CONT EXEC DATE	OBLIGATED	RPT DUE DATE	EXP DATE
34 500	7 13	6 13 57	CD SP 57 65	6 30 57	142 650	4 31 58	6 30 58
60 000	7 18	6 18 57	CD SP 57 68	6 30 57	88 000	5 31 58	6 30 58
155 000	6 17	5 18 57	CD SP 57 55	5 24 57	214 500	5 31 58	6 30 58
72 325	10 13	7 14 57	CD SP 58 15	10 13 57	35 000	4 30 58	6 30 58
			CD SP 58 28	10 15 57	255 000	6 30 58	6 30 58
85 250	10 18	8 27 57	SEE N.J.				
200 000	10 18	8 18 57	CD SP 58 27	10 18 57	325 000	5 31 58	6 30 58
275 000	10 18	3 4 57	CD SP 58 19	10 18 57	175 000	5 31 58	6 30 58
114 800	7 18	6 18 57	CD SP 57 62	6 30 57	183 825	5 30 58	6 30 58
58 475	5 26	8 27 57	CD SP 58 17	3 27 57	110 000	3 31 58	6 30 58
			CD SP 58 22	10 15 57	75 000	5 31 58	6 30 58
81 300	7 31	7 1 57	CD SP 58 4	8 1 57	35 000	6 1 58	6 30 58
100 500	7 10	6 10 57	CD SP 58 9	7 11 57	184 888	6 1 58	6 30 58
284 480	7 14	6 14 57	CD SP 57 67	6 30 57	430 000	6 30 58	6 30 58
			CD SP 58 13	11 22 57	400 000	6 30 58	12 31 58
175 800	11 30	10 31 57					
103 750	10 3	3 3 57	CD SP 58 32	10 15 57	130 000	5 15 58	6 30 58
108 830	1 31	7 31 57	CD SP 58 44	2 20 58	75 000	6 30 58	6 30 58
85 000	3 30	6 12 57	CD SP 58 16	10 1 57	118 124	6 1 58	6 30 58
85 000	8 5	7 8 57	CD SP 58 5	6 5 57	125 000	5 1 58	6 30 58
46 000	7 1	6 1 57	CD SP 57 68	6 25 57	93 000	5 31 58	6 30 58
85 000	12 1	11 1 57	CD SP 58 37	12 2 57	105 000	6 1 58	6 30 58
30 000	8 14	5 14 57	CD SP 57 60	6 4 57	70 300	6 14 58	6 14 58
31 312	8 1	7 1 57	CD SP 57 88	6 30 57	132 150	5 30 58	6 30 58
			INACTIVE				
85 000	6 17	5 17 57	CD SP 57 57	6 34 57	100 000	4 1 58	5 31 58
63 000	11 14	10 15 57	CD SP 58 38	11 14 57	73 000	5 15 58	6 30 58
			INACTIVE				
			INACTIVE				
130 000	6 28	5 28 57	CD SP 57 54	6 28 57	412 473	6 1 58	6 30 58
			INACTIVE				
			CD SP 58 6	3 13 57	304 020	6 1 58	6 30 58
			CD SP 57 55	6 19 57	221 675	3 15 58	5 17 58
95 000	4 30	3 31 57	SEE MO.				
90 000	10 31	3 1 57	SEE MO.				
95 000	3 12	3 12 58	CD SP 58 49	3 12 58	53 800	6 1 58	6 30 58
80 350	7 31	7 1 57	CD SP 58 2	8 1 57	80 000	6 1 58	6 30 58
60 000	6 2	5 3 57	CD SP 57 53	5 24 57	200 000	5 1 58	5 31 58
181 000	5 31	4 30 57	SEE LA.				
			INACTIVE				
85 000	7 31	7 1 57	CD SP 58 3	8 1 57	30 000	6 1 58	6 30 58
			CD SP 58 29	10 15 57	320 800	5 2 58	6 30 58
182 257	7 23		SEE TX.				
85 000	7 3	5 10 57	CD SP 57 63	6 30 57	122 000	5 30 58	6 30 58
			CD SP 58 34	10 15 57	85 000	6 30 58	6 30 58
85 000	12 16	1 6 58	CD SP 58 41	1 7 58	87 500	5 1 58	6 30 58
85 000	7 5	5 10 57	CD SP 58 10	7 10 57	175 000	6 30 58	6 30 58
71 400	7 5	5 10 57	CD SP 57 64	6 30 57	100 000	4 30 58	6 30 58
25 000	1 17 58	11 18 57	CD SP 58 43	1 18 58	30 000	6 30 58	6 30 58
35 000	11 12	3 13 57	CD SP 58 35	11 13 57	42 000	4 1 58	6 30 58
			INACTIVE				
66 041	2 12 58	3 14 58	CD SP 58 47	3 15 58	27 000	6 30 58	6 30 58
			CD SP 58 12	3 4 57	346 403	6 1 58	6 30 58
			CD SP 58 8	8 1 57	58 000	5 31 58	6 30 58
			CD SP 58 20	10 5 57	64 135	6 1 58	6 30 58
			CD SP 58 26	10 15 57	55 340	6 1 58	6 30 58
118 873	3 4 58	2 2 58	CD SP 58 46	3 5 58	35 840	6 30 58	6 30 58
			CD SP 58 33	10 15 57	65 000	6 1 58	6 30 58
			CD SP 58 23	10 5 57	111 775	6 1 58	6 30 58
			CD SP 57 61	6 25 57	33 488	5 31 58	6 30 58
			CD SP 58 7	8 1 57	87 775	5 31 58	6 30 58

EXHIBIT D—STATEMENT OF HON. JOHN LESINSKI, A REPRESENTATIVE
IN CONGRESS FROM THE STATE OF MICHIGAN

HOUSE OF REPRESENTATIVES,
Washington, D. C., May 15, 1958.

HON. CHET HOLIFIELD,
*Chairman, Subcommittee on Military Operations,
House of Representatives, Washington, D. C.*

DEAR MR. CHAIRMAN: For a number of years I have been very much concerned over the lack of action on the part of our Government to move on programs for the construction of civil-defense shelters and am glad to note that your committee has taken steps on the situation.

We know from the reports that are coming out daily that the United States is in grave danger, perhaps the greatest danger we have ever faced. It is reliably reported that the Soviet Union is ever growing in economic and military strength; and she is also subjecting the free world to the greatest barrage of political propaganda and psychological assaults we have ever seen. We do not know when actual armed attack against our nation might also come; we must therefore be prepared for it.

I am cognizant of the fact that the administration has been reluctant to make any move on the programs for construction of civil-defense structures. Perhaps the reluctance, in spite of repeated recommendations, stems from a feeling that such structures might never be used, that they would stand idle for many years, that it would be money down the drain. Taking that into consideration, I have for several months been looking into the question of constructing structures that would serve dual purposes, for civil-defense shelters and for community purposes.

With the cooperation of the officials in the city of Detroit, for example, I have been investigating the possibility of constructing a series of underground tunnels which with appropriate modifications could be used as civil-defense shelters and when the need for them no longer existed could be converted for use as sewers. An outline of this plan is attached hereto.

If the Federal Government should decide to go ahead with mass shelter programs, the type of project described in the attachment would have many advantages. For one thing, such projects would be adaptable to virtually all target cities in the Nation. It affords flexibility of underground movement under emergency conditions that would not be available in most other types of proposed shelters. Of course, this plan is not offered as an alternate to proposals that shelters may also serve as schools, hospitals, underground parking areas, and recreation areas, but rather as a complement to them.

In addition to working on the described plan, I have introduced H. R. 12495 which would make an appropriation of \$250 million to be expended by the Administrator of Civil Defense in making financial contributions to States for shelters and other facilities as authorized in the Federal Civil Defense Act of 1950.

The extreme necessity for the project at this time, not disregarding the employment opportunities it would create, is the fact that these shelters cannot be built overnight. It will take time to complete them and I am fearful that there may not be sufficient time. Neither I nor anyone else is convinced that we will not in the future be attacked. If, as we have been informed, from 50 to 90 percent of enemy bombers penetrate our defenses, there will not be enough time to evacuate our cities and only a very small percentage of the population would escape. These shelters should be considered an integral part of our defense system, for by providing these shelters to protect our people in main industrial areas, our Nation will preserve retaliatory power.

I am hopeful that immediate action will be taken to start construction of civil-defense shelters and wish to assure you, Mr. Chairman, that knowing of your deep personal interest in the matter, I am every ready to offer my cooperation and assistance in the implementation of this vitally important project.

With best wishes, I am,
Sincerely yours,

JOHN LESINSKI, *Member of Congress.*

PRELIMINARY PLAN FOR CONVERTING SEWER STRUCTURES INTO PERSONNEL SHELTERS

NOTE.—This proposal contemplates the immediate construction of certain future sewers called for on our master plan and the temporary use of these structures for personnel shelters. This particular study was concerned specifically with

the future First-Hamilton relief sewer. It is considered that the First-Hamilton sewer is typical of many other proposed sewers. The selection of the specific future sewers best adapted to this proposal has been left for later determination.

It is estimated that there are about 45 miles of future master-plan sewers that could be considered and used as personnel shelters.

Summary

Total length of First-Hamilton sewer available for shelter purposes (13 feet 3 inches dia. and over 16 inches monolithic concrete) .feet...	43, 200
	miles... 8. 2
Number of 1/4-mile sections.....	32
Capacity of each 1/4-mile section.....	persons... 1, 706
Total estimated capacity.....	do... 54, 592
Typical depth to crown.....	feet... 30
Range of depths to crown.....	do... 14 to 36
Cost of sewer only per mile.....	\$2, 000, 000
Cost of equipment per mile.....	\$500, 000
Approximate total cost per mile.....	\$2, 500, 000

The sewer is divided into 1/2-mile sections by steel bulkheads; 2 entrance stairways are centered on the 1/2-mile section. The 1/2-mile section is divided into two 1/4-mile sections. Each 1/4-mile section is served by 1 stairway at the central entrance and is independent from the other section as to all operational equipment and supplies, except for the common first-aid room located near the entrances. The equipment room of each 1/4-mile section effectively divides the 1,706-person capacity into 2 groups of 853 which can be handled and controlled more easily.

ENTRANCES

Entrances to the sewer are located every one-half mile along its length. Each entrance consists of 2 stairways, 1 to feed each 1/4-mile section. The stairways should be located in the parkway adjacent to the curb. These stairwells should be of reinforced concrete construction with the surface opening protected by a concrete slab of the rolling-hatch type and weather covers as used on standard civil defense personnel shelters. The stair tread should be of sufficient width to easily accommodate a double line of people. The stairs should have flights down to approximately the floor level of the sewer. Any difference in elevation can be corrected by slanting the 5 by 8 foot rectangular passageway which extends from the bottom of the stairwell to the sewer. Finally, a steel door should be provided at the sewer end of the passageway.

CONTROL AND CHECK-IN STATION

This section is provided for several purposes:

- (1) To act as the general control center for the 1/4-mile section.
- (2) To check in and count persons entering.
- (3) To route the injured to the adjacent first-aid station.
- (4) To have telephone communication with all other sections.
- (5) To act as a public address system center.
- (6) To prohibit the flow of unauthorized persons to other sections.

FIRST-AID SECTION

This is the only facility which the 2 adjoining 1/4-mile sections share in common. Entrance can be made from either 1/4-mile control station. Working space is provided at each entrance for immediate care. Bunks for 32 persons are located in the central portion of this section, 24 on center stanchions, 8 mounted at the springline. An auxiliary water supply in tanks below the floor should be provided.

SLEEPING SECTION

There are 2 sleeping sections per one-quarter mile, each having a capacity of 288 people sleeping and 320 people sitting. The bunks are in three tiers and are supported on stanchions along the center of the sewer. All bunks fold up, as do the side benches, to allow more passage room for the initial inflow of people.

SITTING SECTION

There are 2 sitting sections per one-quarter mile, each having a capacity of 245 persons. The center double bench is stationary and has drawer space under the seats for the storage of small necessities for the occupants. The side benches are of the same type as used in the sleeping section and fold up to allow more room for the initial inflow of people.

WASH SECTION

There are two wash sections per one-fourth mile. The floor level of this section is 1 foot 9 inches above normal floor level. The fresh water for this section can come either from the fresh-water tank beneath the equipment room floor approximately 30 feet away, or from tanks buried outside the cylinder. It should be noted that any tanks or other equipment outside of the sewer itself would present a difficult maintenance problem over extended periods. The waste water can be stored in tanks below the floor of the wash section or in tanks outside the sewer. Another possibility for the exclusion of waste water is to pump it up to existing sewers in the immediate vicinity. However, the successful operation of this plan rests on the assumption that the existing sewer system will not suffer damage from the blast.

CHEMICAL TOILET SECTION

There are two toilet sections per one-fourth mile. The floor level of this section is 1 foot 9 inches above normal floor level. Each section has 20 stall type toilets. The tanks below the floor should be of welded construction using copper-bearing steel to withstand chemical action. The capacity of the tank is to be 11,000 gallons or approximately 13 gallons per person. The filling of this tank is to be done through 6-inch-diameter inlet pipes from the surface. The same pipes can be used for pumping out the tank after use. Hatches are provided in the top of the tank for the addition of caustic soda which disinfects, liquefies and, to some extent, deodorizes the solids. For ideal operation, agitators should be provided in the tank to produce the proper chemical action.

MECHANICAL EQUIPMENT AND STORAGE SECTION

There is one mechanical equipment and storage section per one-fourth mile. The central 300 feet of the one-fourth is allotted for this section. Some of the equipment to be provided should include the following:

- (1) Riser shafts to surface for air inlet and exhaust.
- (2) Inlet fan and motors.
- (3) Exhaust fan and motors.
- (4) Air filters and decontamination equipment.
- (5) Electric generators (diesel powered).
- (6) Diesel oil storage outside sewer with surface fill and vent pipes.
- (7) Fresh-water supply (2 tanks below floor, 11,000 gallons each).
- (8) Pumps for fresh-water supply to taps.
- (9) Heating equipment for winter operation.
- (10) Food-storage space.
- (11) Food preparation and distribution space (1 per $\frac{1}{8}$ -mile section).
- (12) General maintenance space.
- (13) Sleeping space for operations crew.

In placement of equipment, sufficient space should be left to allow a double line of people to pass through with reasonable speed and safety.

CONDUITS

Throughout the entire length of the sewer, conduit space should be provided for the following:

- (1) Air—inlet and exhaust.
- (2) Electrical—light and power, telephone, public address system.
- (3) Water.

SUMP ROOM

There is 1 sump room for each $\frac{1}{2}$ -mile section, and is located at the low end of the $\frac{1}{2}$ -mile section at the steel bulkhead. This room is provided to take care of any seepage which may occur. The seepage flows along the invert for

the $\frac{1}{2}$ -mile length and is collected in the 1- by 1- by 8-foot sump which has a capacity of 60 gallons.

STEEL BULKHEADS

The steel bulkheads seal off each $\frac{1}{2}$ -mile section from the adjacent sections and should be designed to protect the section from any fire, explosion, or other disaster occurring in the neighboring section. A steel access door, sliding or hinged, should be used only under extreme emergency conditions. At all other times, the door should be shut and locked.

FLOOR SYSTEM

The general floor system in the sewer should be of the precast concrete slab type, laid between supports which rest on the bottom of the cylinder. The mechanical equipment section requires a precast floor or concrete mounting bases to provide adequate support for the equipment. Partitions shown should be of cinder-block construction or equal.

ESCAPE HATCHES

In the event of the stairway exits being blocked, manholes which are normally used on sewers can be used as escape hatches. Circular steel doors should be installed at the opening of the manhole into the sewer and $5\frac{1}{2}$ feet of compacted sand and gravel backfill placed on top for contamination protection. If hatch is used, the backfill can be removed through the small slot by hand.

ALTERNATE PLAN

RAILWAY

An alternate plan for the use of the First-Hamilton sewer in time of emergency is to provide a narrow-gage railway using battery-powered locomotives which could transport persons from points along the length of the sewer to the Seven Mile Road exit or more distant points out of the danger zone. Using this plan, sewers of diameters down to 10 feet could be used for 2-way operation and sewers with diameters down to 8 feet could be used for 1-way operation. Note that a breakdown in transporting equipment could possibly slow or completely block all passage within the sewer.

This railway plan could be combined with the shelter plan by using one end of the sewer for temporary quarters and the other end for railway transport of personnel. Another possible combination of the two plans could be made by keeping all bunks and benches folded up to allow clearance for track and transporting equipment until all occupants are distributed among the sections by the transport system.

EXHIBIT E—STATEMENT OF THE AMERICAN MEDICAL ASSOCIATION

AMERICAN MEDICAL ASSOCIATION,
Chicago, Ill., May 13, 1958.

HON. CHET HOLIFIELD,

Chairman, Military Operations Subcommittee, Committee on Government Operations, House of Representatives, Washington, D. C.

DEAR MR. HOLIFIELD: The American Medical Association is advised that the President's Reorganization Plan No. 1 of 1958, providing new assignments for the conduct of Federal defense mobilization and civil defense functions, is currently being considered by the Military Operations Subcommittee.

As the association understands the proposed plan, its purpose is to enhance and make more effective the role of the Federal Government in nonmilitary defense programs. Under the plan, the broad program responsibilities for coordinating and conducting the interrelated defense mobilization and civil defense functions would be vested in the President for appropriate delegation. The Office of Defense Mobilization and the Federal Civil Defense Administration would be consolidated in a new agency which would be known as the Office of Defense and Civilian Mobilization.

The basic concept of national mobilization is accepted as the "will of the people to resist." This concept depends on the sustained physical and mental

health of the people and as such has interested the American Medical Association for many years.

In its concern with the health and medical aspects of civil defense, the association has recognized, for a number of years, the urgent need for Federal leadership, direction, and coordination. The association believes that civil defense, like military defense, is an integral part of national defense which requires greater Federal responsibility and leadership.

More specifically, the association is concerned with the status, in any Federal agency, of the office responsible for medical and health activities. The association is convinced that medical and health activities are one of the most, if not the most, important function in sustaining the will of the people to resist. In June 1954, the association's house of delegates adopted a resolution requesting the Administrator of the Federal Civil Defense Administration to reexamine the position of the Health Division and to elevate that Division to a status commensurate with its obligations and responsibilities. In principle, this was ultimately accomplished in the December 1957 reorganization of the Federal Civil Defense Administration with the creation of the position of Assistant Administrator, Health and Medical Affairs.

In June 1956 the association's house of delegates approved the broad objective of strengthening the Federal civil defense program, but was of the opinion that the method of accomplishing this was a matter for determination by the Congress with the advice and assistance of the President and the State governments.

In testimony before your subcommittee on March 7, 1957, on H. R. 2125, 85th Congress, the association again emphasized that the medical and health functions of the civil defense program merit stature and prestige commensurate with the duties and responsibilities which must be assumed. Within the organization of the Office of Defense Mobilization there now is established a position of Assistant Director for Health and a civilian Health Resources Advisory Committee. The association believes that the health and medical functions of the Federal Civil Defense Administration and the Office of Defense Mobilization must be maintained at top level in the organization of the proposed Office of Defense and Civilian Mobilization for the good of our country and our people should our Nation ever again be confronted with another national emergency.

The association is confident that the subcommittee, in furtherance of its serious efforts to strengthen the civil defense and mobilization program of our country, will give this matter of medical and health affairs the urgent and earnest attention which it merits.

We would appreciate it if you would make this letter a part of your official record of the hearings.

Sincerely yours,

F. J. L. BLASINGAME, M. D.,
General Manager.

EXHIBIT F—STATEMENT OF COL. J. C. GAULT, EXECUTIVE DIRECTOR,
OHIO VALLEY CIVIL DEFENSE AUTHORITY

OHIO VALLEY CIVIL DEFENSE AUTHORITY,
Cincinnati, Ohio, May 20, 1958.

HON. CHET HOLIFIELD,
*Congressman of United States,
House Office Building, Washington, D. C.*

DEAR CONGRESSMAN: I believe the time is now here when an entirely new concept pertaining to civil defense operations must be adopted. With the proposed merger of ODM and FCDA it becomes even more imperative that we take another look at the direction we have come so far and decide what road we must take for the future.

One must admit that—

(a) The methods thus far adopted to operate civil defense at State and local levels has not been the best, to say the least.

(b) That no matter what you pinpoint as the greatest need in civil defense for emergency purposes, one must admit that time prior to an actual emergency and what you do to prepare yourself for an emergency, is the key to how much of an impact civil defense can and will make during an emergency. The ingredients, such as shelters, evacuation, or a hundred other needs, after all, are ingredients or tools to make civil defense a living program. The

people and methods who must use the tools must come first, if these tools are not to be wasted when and if they are provided.

I am particularly concerned with the method of local organization and eventual operation of civil defense which has not proved feasible. Definitely, this is true in the case of target cities. The local city and county administration have not, nor do they hold any promise that they will adopt interest or provide even matching funds (H. R. 7576) to carry out the necessary civil defense requirements. There are many reasons for this but the key reason is enough to convince anyone who is acquainted with local problems to realize the truth of this statement.

Modern weapons have knocked into a cocked hat the old idea of one city or one county civil defense. In fact, not only has it become a job of multiple counties, but in a great many cases multiple State target-area planning and operations. We are then at a point where we are in the midst of the present struggle of metropolitan government for everyday functions. By accident or whatever you call it, we find ourselves a part of the struggle. Given time, these questions will resolve themselves as they must be. However, civil defense cannot afford the luxury of time nor the political embroilment it must face as part of the overall metropolitan government struggle.

Then, too, there is the fact that—

(a) Somehow civil defense must be built.

(b) That it cannot be built with any great fanfare which places our National Government in the peculiar position of seeking peace and disarmament on the one hand, yet openly preparing itself to expect a world war III rather than preparing civil defense as a deterrent toward war on the other hand.

How, then, is the best way to accomplish these many facets of the civil defense problem?

It is my belief and contention that we must utilize the past experiences where such similar matters have been handled by agencies of the National Government. The best illustration is the methods adopted by the utilization of the National Guard. There are other agencies that have had similar problems. However, this is what I envision should be done:

Let us assume that—

(a) Either the proposed merger will be affected or;

(b) That some method will be found to eventually create a separate agency as proposed in your bill.

In either case there should be created at field level (the 48 States and Territories) 72 Federal field offices (the 72 critical target areas). Under civil service, based on a standard organization, utilize the proposed regional organizations (7 now, 10 proposed).

Each target-area office should operate in conjunction with, and guidance of, a State civil defense office for organizational and operations purpose, but responsible to the region concerned. This can be done exactly as you operate the National Guard in peacetime and federalized under wartime emergencies. Where you have a State adjutant to operate the State guard, who is federally recognized, you operate civil defense offices and units under a federally recognized State director who is responsible to the Governor of the State.

The local director should be federally recognized by a national agency with the consent of the State, just as a regimental commander of the guard is recognized Federally. Both are paid by the Federal Government; both can be equipped by the Federal Government. The only difference is: one is military, the other non-military. Just as the local guard commander must recruit from the local population, and work with local government, so the local director will recruit, integrate on a cooperative basis, Federal, State, and local agencies into a workable plan.

In the long run the cost will be cheaper and the problem of civil defense taken out of the hands of every "do-gooder" coming down the pike. You immediately professionalize the job of civil defense and give it the dignity it should and must have. More important, instead of 3,000 different plans you can begin to standardize civil defense organizations and operations on a national scale without infringing on the right of the State or local government. You will be in a position to help them rather than harass them. You will take civil defense out of politics and instead of being a beggar it can become an organization with dignity just as any other Federal field agency at the local level is today. The FBI and several other departments of Government who must work and cooperate with local government are good examples.

It is fully realized that such a plan may have a number of pitfalls and may have to be worked out in some details. The idea has considerable merit and should be thoroughly gone into. If we can do this with an open mind, without personal consideration, and think of only what is best for the country, then we can find the proper answers to this problem.

We must have this new approach and we must have it now, providing this type of Federal assistance will carry out the intent of the partnership principle of H. R. 7576 and carry it beyond to your idea that civil defense is a problem of the National Government just as military defense is a national problem.

In sending this proposal to you, I ask that it be made a matter of record of the present proceedings of your committee.

Sincerely yours,

J. C. GAULT, *Executive Director.*

EXHIBIT G—LETTER OF HERBERT S. GREENWALD, SUBMITTED BY
SENATOR JACOB K. JAVITS OF NEW YORK

UNITED STATES SENATE,
COMMITTEE ON RULES AND ADMINISTRATION,
May 27, 1958.

MR. HERBERT ROBACK,
*Staff Administrator, Committee on Military Operations,
House of Representatives, Washington, D. C.*

DEAR MR. ROBACK: In connection with the recent hearings held by the Committee on Military Operations concerning civil defense shelter requirements, I would like to submit for your consideration a copy of a letter to me from Herbert S. Greenwald which makes a very interesting point about the need for the incorporation of a shelter program in the title I housing program.

If it is feasible at this point, I would very much appreciate it if this letter were made a part of the record of the hearings.

Sincerely,

JACOB K. JAVITS.

MAY 12, 1958.

HON. JACOB K. JAVITS,
*United States Senate,
Washington, D. C.*

DEAR SENATOR JAVITS: Thank you for offering to bring this letter and its subject matter to the attention of the proper committees of Congress.

It is my understanding that the Government Operations Committee of the House of Representatives is exploring the nature of the civil defense shelter requirements and the scope of practical, possible solutions.

The point of departure for my letter is the assumption that some sort of shelter construction program is needed and, as a practical matter, can be undertaken.

My associates and I, along with other groups, are engaged in carrying out or have under construction various title I FHA urban rehabilitation projects in various major cities. By coincidence, all major cities have become important potential targets for enemy atomic attack.

Irrespective of whether actual attack is to occur, it would appear necessary to provide our citizens residing in major cities with the belief that, in event of hostilities, they have at least minimal chance of survival. Otherwise, in time, it will probably be impossible to command the necessary political support from the electorate for a strong foreign policy and the military and foreign aid programs relating to such a policy.

I am reliably informed that technical solutions to the defense shelter problem are in a state of flux owing to changes in the nature of possible attack with its resultant effect on the time that prudence and conditions dictate be allowed for advance warning to the civilian population.

Assuming that time for advance warning is confined to 15 to 30 minutes, then it seems mandatory that the shelter be incorporated in the structures where the populace lives and works.

Additionally, I am assuming that the Congress will probably conclude that protection against impact and the direct blast effect is financially impractical and that, consequently, shelter may be confined to protection against fallout and incidental damage from radioactive sources during a 30- to 60-day period when plans for mass evacuation from the exposed area might be implemented.

Another valid assumption seems to be that it is impractical to contemplate that the office and residence structures in our major cities will be reconstructed in their entirety to meet the defense shelter problem and, as a result, the problem will be dealt with piecemeal in the general course of new construction.

On the basis of the above assumption, I recommend that the Congress consider enacting amendments to existing FHA and other appropriate legislation to provide for federally financed incentives to permit and pay for the costs of including such adequate civil defense shelter facilities as may meet minimum technical requirements to be established by designated appropriate executive departments or agencies.

The title I urban rehabilitation program is gathering momentum and any delay in reaching decisions as to how to provide for the defense shelter requirements means the the passing up of additional opportunities for meeting defense shelter needs in the new building sponsored by the FHA title I program. Consequently, I believe action should be taken before the adjournment of Congress.

Kindly feel free to call upon me directly or through my counsel, Mr. William R. Burt (whose office is in the Barr Building in Washington, D. C.) for any assistance that I may provide to you or to the appropriate committee of Congress in this matter.

Respectfully submitted.

HERBERT S. GREENWALD.

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